SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT AMENDMENTS OF 1992

(SAFE AND EFFECTIVE USE OF SLUDGE)

HEARING

BEFORE THE

SUBCOMMITTEE ON CONSERVATION, CREDIT, AND RURAL DEVELOPMENT

OF THE

COMMITTEE ON AGRICULTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

SECOND SESSION

ON

H.R. 4360

APRIL 2, 1992

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SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT AMENDMENTS OF 1992

THURSDAY, APRIL 2, 1992

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSERVATION,
CREDIT, AND RURAL DEVELOPMENT,
COMMITTEE ON AGRICULTURE,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:05 a.m., in room 1302, Longworth House Office Building, Hon. Glenn English (chairman of the subcommittee) presiding.

Present: Representatives Penny, Long, Stenholm, Smith, Gunderson, Barrett, and Nussle.

Also present: Representative E (Kika) de la Garza, chairman of the committee, and Representative Tom Coleman, ranking minority member.

Staff present: Joseph Muldoon, associate counsel; Francie Monaghan, clerk; Benjamin I. Baker, James E. McDonald, James A. Davis, Merv Yetley, David Ebersole, and Pete Thomson.

OPENING STATEMENT OF HON. GLENN ENGLISH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OKLAHOMA

Mr. ENGLISH. The subcommittee will come to order.

H.R. 4360 would require the Secretary of Agriculture to establish a program to ensure the safe and effective application of sludge from any sewage treatment plant that is applied to the agricultural land of a State not served by that treatment works. Under the bill, no sludge could be applied to an agricultural land unless an agency of the Department of Agriculture has analyzed the sludge and determined it to be safe and suitable for the application to agricultural land; and also the Soil Conservation Service has, among other things, determined that the land on which it is to be applied is suitable for such an application; approved the rate and frequency of application; the method of application; and the methods for alleviating the effects of spills. The Soil Conservation Service would be required to conduct the inspections to determine if the application of sludge was in compliance with requirements imposed under the bill. Civil money penalties would be imposed for violations.

The requirements imposed under this legislation would be in addition to any other requirements imposed under other State or Federal laws. The Agricultural Research Service would be authorized to carry out research projects for the purpose of determining the degrees to which various soil types may have the capacity for han-

dling various levels of applications of sludge as compared to other organic or inorganic fertilizers, pesticides, or other agricultural chemicals and the extent to which various farming practices may be used to increase the effectiveness of the use of sludge in agricultural production. The party who owns or controls sludge would be required to pay fees to cover the cost of all services and functions performed by the Department of Agriculture under the bill and to fund the research projects carried out by the Agricultural Research Service.

Let me say that that states what this legislation does, but let me say that in scope it goes much further than this. We have had facing us for some time increasing numbers of questions with regard to polluting the environment, particularly as far as farmers are concerned, and in many cases what we're seeing is that agriculture is being singled out, the finger is being pointed to agriculture as being the cause of pollution, which may or may not be true. In fact, we're seeing increasing numbers of cases now in which farmers are being blamed for pollution and, in some cases, lawsuits being brought against farmers which are highly suspect.

There's no question that the environment is playing a growing role as far as American agriculture is concerned, and we're finding in many cases the American family farmer is vulnerable. Let me also say that we find ourselves facing problems from abroad, as we have for some time, with trade barriers being set up against American agricultural products. We're seeing quite a host of ingenious reasons as to why these barriers may be set up against American agricultural products, and we assume that it's only a matter of time until we see some of the more creative trade barriers point to applications of material on American agricultural lands.

We also recognize and understand that every farm is different. It has different kinds of soil, it has different kinds of weather, and all these combined make what can and cannot be safely applied to that land different. We're seeing a growing tendency, though, to move in the direction of simply across the board this is banned or that's banned or certain amounts can or cannot be applied to the land, and it may or may not be safe.

I think it makes a great deal of sense to begin to look at agricultural lands from the standpoint of an individual farm and that environment in which that farm exists, to look to that farm from the standpoint of what can or cannot be safely applied. This has benefits both to the farmer and certainly to those people who are concerned about the environment. I think that it offers a great deal of protection to the American family farmer, in this litigation world in which we live, as to something that he can point to as assuring him that he in fact has some level of protection—protection that has been afforded to him by the Department of Agriculture and the scientific community.

So as I say, while this on the surface seems to be a very simple bill, it really is opening the door for us to look at the issue of site-specific applications to the land, and that's something that we think will be very beneficial. We fully appreciate and understand that the States, as far as sludge is concerned, have the authority—any nonhazardous material such as that, they have the authority to determine what can be used in their State, and we are not in

any way attempting to override or interfere with that in any way. In fact, we would assume that this would compliment that, since it would give assurances—this information would be made available to the States, and it would give assurances to the State that their laws are being adhered to, and certainly there's no intent to get around that.

As far as the Environmental Protection Agency is concerned, we have heard tell that they plan to come forth with some regulations dealing with this, and again, this effort does not in any way interfere with this. What we're focusing on is agricultural land and what is being applied to that agricultural land and what that may do as far as the products that are produced there, particularly our trading partners overseas and to those who may live in the vicinity. There is sludge and there's sludge. There are different kinds of sludge containing different kinds of materials, and that is the key. So it's a little bit of a misnomer when you simply say sludge. That doesn't really tell you a great deal. We want to make certain that we know what is contained within that material.

The reason this legislation focuses primarily on interstate as opposed to intrastate is primarily because of the material being shipped across State lines great distances. Obviously, the questions arise as far as whether that has or has not been inspected to the degree that is necessary. We feel that if it's going to be applied to American agricultural land, it should be inspected thoroughly, and that's the reason it provides for that.

Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

I have a statement for the record, and I'm anxious to get to these witnesses while this subject is still fresh in my mind. Thank you. [Laughter.]

[The prepared statement of Mr. Smith follows:]

Statement of
Robert F. (Bob) Smith
before the
Subcommittee on Conservation, Credit and Rural Development
on HR 4360,
the
Soil Conservation and Domestic Allotment Act Amendments of 1992
April 2, 1992

Mr. Chairman, I'd like to commend your foresight in drafting and introducing this legislation. Though sewage sludge is a somewhat less that glamorous topic, it is product that is gaining increasing attention in American agriculture.

About 7.7 million metric tons of sewage sludge is produced in the United States each year, about 4 million metric tons is applied to our agricultural lands. In Oregon, where application of sludge to pasture, hay and silviculture land has become commonplace over the last 15 years, over 90% of the State's sludge is disposed of in the manner each year.

This is, of course, entirely within the State so it is outside the scope of H.R. 4360. However, it serves to illustrate the important role sludge could play in fulfilling crop nutrient needs. Currently, Oregon's Department of Environmental Quality coordinates with the Soil Conservation Service to ensure safe utilization of this resource.

I am less concerned about granting this or that federal agency jurisdiction over this practice as I am about maintaining consumer confidence in the healthfulness and safety of our food production system. While I understand that fruit and vegetable producers do not generally use sewage sludge on their crops, I have also seen stories about asbestos, heavy metals and biological contaminants in sludge.

Setting standards for the sludge itself, establishing requirements for the soil to receive sludge and learning about farming practices that best utilize sludge are all important. However, the key to consumer confidence will be enforcement. We must make certain that any enforcement procedures employ the appropriate government resources, do not unnecessarily burden producers and ultimately, bolster consumer confidence in their food.

Mr. Chairman, I look forward to hearing the testimony of today's witnesses and working with you on HR 4360.

Mr. ENGLISH. The subject does invite from time to time a little levity, but let me say in response to my good friend from Oregon that the real experts with regard to this subject—namely, those who reside on the other side of Capitol Hill—unfortunately couldn't testify with regard to sludge. We understand they put a lot of it out over there on that side. [Laughter.]

So with that, that will be the last remark that we'll make along those lines, particularly pertaining to our colleagues in the U.S. Senate. They're all fine people over there.

[H.R. 4360 follows:]

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102D CONGRESS
2D SESSION

H. R. 4360

To amend the Soil Conservation and Domestic Allotment Act to require the Secretary of Agriculture to carry out a program to help ensure the safe and effective use of sludge to improve soil fertility; and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

MARCH 3, 1992

Mr. ENGLISH (for himself and Mr. DE LA GARZA) introduced the following bill; which was referred to the Committee on Agriculture

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A BILL

To amend the Soil Conservation and Domestic Allotment Act to require the Secretary of Agriculture to carry out a program to help ensure the safe and effective use of sludge to improve soil fertility; and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Soil Conservation and Domestic Allotment Act Amendments of 1992".

SEC. 2. REFERENCES.

Except as otherwise specifically provided, whenever in this Act a section or other provision is amended, repealed, or referenced, such amendment, repeal, or reference shall be considered to be made to that section or other provision of the Soil Conservation and Domestic Allotment Act (16 U.S.C. 590a et seq.).

SEC. 3. PURPOSE.

It is the purpose of this Act to—

(1) further the policy of Congress declared in section 1 of the Act (16 U.S.C. 590a), especially, among other things, to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources; and

(2) further the policy declared in section 7(a) of the Act (16 U.S.C. 590a), especially, among other things, to secure—

(A) the preservation and improvement of soil fertility;

(B) the promotion of the economic use and conservation of land; and

(C) the diminution of exploitation of and wasteful and unscientific use of national soil resources.

SEC. 4. ESTABLISHMENT OF PROGRAM.

The Act is amended by adding at the end the following new section:

"SEC. 18. APPLICATION OF SLUDGE TO AGRICULTURAL LANDS.

"(a) ESTABLISHMENT.—Within 180 days after enactment of this section, the Secretary of Agriculture shall establish a program to ensure the safe and effective application to agricultural land of sludge from a treatment works if the agricultural land to which the sludge is intended to be applied is located in a State other than a State served by the treatment works.

"(b) REQUIREMENTS.—

"(1) PROHIBITION.—The program established under subsection (a) shall provide that no person may apply to agricultural land sludge from a treatment works that does not serve the State in which the agricultural land is located unless—

"(A) the Animal and Plant Health Inspection Service, or another agency of the Department of Agriculture designated by the Secretary of Agriculture, under guidelines issued by the Agricultural Research Service, has—

"(i) analyzed the organic and inorganic contents of the sludge; and

'(ii) determined, on the basis of the analysis, that the sludge is safe and suitable for application to agricultural land;

"(B) the land on which the sludge is intended to be applied has been determined by the Soil Conservation Service to be suitable for such application on the basis of, among other things, the kinds of soils comprising the land to which the sludge is proposed to be applied, the conservation systems in place on the land, the topography of the land, the organic and inorganic contents of the soil, the climatic conditions in the area, and the organic and inorganic contents of the sludge;

"(C) the Soil Conservation Service, in consultation with the Animal and Plant Health Inspection Service (or another agency of the Department of Agriculture designated by the Secretary of Agriculture under subparagraph (A)), and the Extension Service, has—

"(i) approved the rate and frequency of sludge application to the land, taking into consideration, among other things, the kinds of soils comprising the land to which the sludge is proposed to be applied, the

organic and inorganic contents of the soil, the types of crops intended to be produced on such land and the nutrient needs of such crops, and the organic and inorganic contents of the sludge;

"(ii) approved the method to be used in applying the sludge to the soil, taking into consideration, among other things, the kinds of soils comprising the land to which the sludge is proposed to be applied, the degree to which the soil may be erodible, the proximity of human habitation, and the climatic conditions of the area;

"(iii) approved the methods for alleviating the effect of any spills that may occur during the application process;

"(iv) delineated those areas of land to which the application of the sludge is to be restricted in order to protect surface and ground water and to carry out the policy of Congress enumerated in section 1 and the policy of the Act enumerated in section 7(a); and

"(v) established such other conditions on the application as may be necessary to

carry out the policy of Congress enumerated in section 1 and the policy of the Act enumerated in section 7(a), especially the protection of the productivity of agricultural land, the preservation of natural resources, and the protection of the food supply through, among other things, the implementation of conservation systems on the land to which the sludge is to be applied and the establishment of limitations on the types of crops that may be produced on the land subsequent to the application;

"(D) the party who owns or controls sludge for which an analysis is performed under paragraph (1)(A)(i) has agreed, in writing, to be responsible for—

"(i) applying the sludge in compliance with each of the conditions to which the application may be subject under subparagraph (C); and

"(ii) alleviating any adverse effects that may result if the application is not in compliance with any such conditions; and

"(E) the Soil Conservation Service has been granted written authorization by the

owner of the land on which the sludge is to be applied to conduct such inspections as necessary to determine the extent to which there has been compliance with the approved application rate, approved method of application, restrictions on applications on the designated areas, approved methods for alleviating spills, and all other conditions to which the application may be subject under subparagraph (C).

"(2) APPLICATION TO OTHER LAWS.—The requirements provided for in this subsection shall be in addition to any other requirements that may be imposed on the application of sludge to agricultural lands under any other law.

"(c) PENALTIES.—

"(1) APPLICATION OF UNSAFE SLUDGE.—Any person who knowingly applies sludge that has been determined by the Animal and Plant Health Inspection Service to be unsafe or unsuitable for agricultural land application under subsection (b)(1)(A) to any agricultural land located in a State other than a State served by the treatment works that produced the sludge shall be subject to a civil penalty of not more than $100,000 per violation.

"(2) APPLICATION OF SLUDGE OF UNDETERMINED SAFETY.—Any person who knowingly applies sludge that has not been determined by the Animal and Plant Health Inspection Service to be safe and unsuitable for agricultural land application under subsection (b)(1)(A) to any agricultural land located in a State other than a State served by the treatment works that produced the sludge shall be subject to a civil penalty of not more than $50,000 per violation.

"(3) APPLICATION TO UNSUITABLE AGRICULTURAL LAND.—Any person who knowingly applies sludge to any agricultural land—

"(A) located in a State other than a State served by the treatment works that produced the sludge; and

"(B) that has been determined by the Soil Conservation Service under subsection (b)(1)(B) to be unsuitable for such application, shall be subject to a civil penalty of not more than $25,000 per violation.

"(4) APPLICATION TO AGRICULTURAL LAND OF UNDETERMINED SUITABILITY.—Any person who knowingly applies sludge to any agricultural land—

"(A) located in a State other than a State served by the treatment works that produced the sludge; and

"(B) that has not been determined by the Soil Conservation Service under subsection (b)(1)(B) to be suitable for such application,

shall be subject to a civil penalty of not more than $10,000 per violation.

"(5) VIOLATION APPLICATION.—Any person who knowingly applies to any agricultural land sludge from a treatment works that does not serve the State where the agricultural land is located in violation of any condition established under subsection (b)(1)(C) for such application shall be subject to a civil penalty of not more than $10,000 per violation.

"(6) FAILURE TO ALLEVIATE.—Any person who, in violation of an agreement signed pursuant to subsection (b)(1)(D), fails to alleviate any adverse effects resulting from a noncompliant application of sludge shall be subject to a civil penalty of not more than $5,000 per day until the person complies with the responsibilities imposed under the agreement.

"(d) RESEARCH.—In connection with the program established under subsection (a), the Agricultural Re-

search Service shall carry out, to the extent that funds are available under subsection (e), such number of research projects as the Secretary of Agriculture may determine necessary for the purpose of determining, among other things—

"(1) the degree to which various kinds of soils may have the capacity to handle various levels of applications of sludge, with various compositions of organic and inorganic matter, when compared with other organic and inorganic fertilizers, pesticides, and other chemicals that may be applied to agricultural lands, while furthering the policy of Congress enumerated in section 1 and the policy of the Act enumerated in section 7(a), without any adverse effects on the food that may be produced on such soils, to livestock pasturing on such soils, or to the preservation of natural resource; and

"(2) the extent to which various farming and soil conservation practices may be used to increase the effectiveness of the use of sludge in the production of agricultural commodities, while furthering the policy of Congress enumerated in section 1 and the policy of the Act enumerated in section 7(a), without any adverse effects on the food that may be produced on such soils, to livestock pasturing on

such soils, or to the preservation of natural resources.

"(e) REGULATIONS AND FEES.—

"(1) IN GENERAL.—The Secretary of Agriculture shall promulgate such regulations as are necessary to carry out this Act.

"(2) FEES.—The regulations promulgated under paragraph (1) shall provide for a schedule of fees for the functions and services performed by an agency of the Department of Agriculture pursuant to subsection (b). The regulations shall provide that the party who owns or controls the sludge for which an analysis is performed under subsection (b) shall be liable for the payment of all fees in connection with the performance of all services and functions required under subsection (b) in connection with such sludge. The fees establish in the schedule shall be in amounts that will be sufficient to—

"(A) cover all costs incurred by the Department of Agriculture in connection with performing the services or functions of the program established under subsection (a) including, but not limited to, the costs of services required under subsection (b); and

"(B) cover the costs of the research projects authorized under subsection (d).

"(3) DEPOSIT OF FUNDS.—The fees collected to cover the costs of the services and functions described in paragraph (2)(A) and to fund research projects under subsection (d) shall be deposited in a separate account in the Treasury and shall be immediately available without fiscal year limitation to—

"(A) reimburse agencies of the Department of Agriculture for carrying out the services and functions under the program; and

"(B) the Agricultural Research Service to carry out such research projects.

"(f) Definitions.—

"(1) AGRICULTURAL LAND.—As used in this section, the term 'agricultural land' means crop land, pastureland, native pasture, rangeland, orchards, vineyards, nonindustrial forest land, and any other land used to produce or support the production of an annual or perennial crop of a commodity, aquaculture product, nursery product, or livestock.

"(2) STATE.—Notwithstanding section 17(a), as used in this section, the term 'State' means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Common-

wealth of the Northern Marianna Islands, the Virgin Islands, Guam, American Samoa, and the Trust Territory of the Pacific Islands.

"(3) TREATMENT WORKS.—As used in this section, the term 'treatment works' means any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage.".

SEC. 5. EFFECTIVE DATE.

This Act and the amendments made by this Act shall be effective on the date of enactment.

Mr. ENGLISH. Our first witness is Mr. Galen Bridge, Associate Chief of the Soil Conservation Service, U.S. Department of Agriculture, accompanied by Dr. Rufus Chaney, it's my understanding.

Is that right, Mr. Bridge?

Mr. BRIDGE. That's right.

Mr. ENGLISH. Mr. Chaney, if you would like to come forward.

He's the Research Agronomist with the Agricultural Research Service, U.S. Department of Agriculture.

Mr. Bridge, we'll let you lead off, and if you would—and let me say this to all of our witnesses today—if you would please summarize your testimony, your complete written testimony, without objection, will be made a part of the record.

STATEMENT OF GALEN S. BRIDGE, ASSOCIATE CHIEF, SOIL CONSERVATION SERVICE, U.S. DEPARTMENT OF AGRICULTURE, ACCOMPANIED BY RUFUS CHANEY, RESEARCH AGRONOMIST, AGRICULTURAL RESEARCH SERVICE

Mr. BRIDGE. Good morning, Mr. Chairman and Congressman Smith, it's good to be with you this morning and have the opportunity to testify on this bill.

As you've noted, Dr. Chaney is with me. He's a world expert in terms of soil fertility and food chain issues related to the whole sewage sludge business.

First, Mr. Chairman, let me state our perception that the sponsors of the bill and certainly USDA share some common ideas about municipal sewage sludge. First, under proper policies and guidelines, sludge can be recycled safely as an organic nutrient. Second, the application of sludge fits within our one-plan concept of total resource management. You spoke very eloquently to that in your opening comments about site-specific concerns, and we're concerned that we will be able to bring into a single plan our agricultural production systems and the environmental concerns in a balanced manner. Third, the beneficial uses of sludge can establish a win-win situation—certainly taking a waste, using it as a resource, alternative agricultural options are enhanced, certain soils can be restored or made more productive, and the environment can be protected. And fourth, the research capabilities, technical abilities, and the delivery system of the Department of Agriculture have a lot to offer this country in terms of helping individual farmers as our society makes better use of municipal sewage sludge as a resource.

So we do share some of the common goals concerning sludge. However, USDA has provided extensive comments to EPA on their proposed sludge regulations, and we anticipate that the final rule which they will promulgate will reflect our comments, and therefore, we do oppose H.R. 4360 at this time. We would urge the subcommittee to defer further consideration of this bill at least until it has had an opportunity to fully analyze the final rule once it is published later this year. It is our hope that both USDA and the subcommittee will be satisfied with EPA's final rule. Were H.R. 4360 to be enacted, it would essentially require USDA to begin a regulatory process that EPA has been working on for more than a

decade. This could cause confusion and could be detrimental to our goals for beneficial use of sludge.

Let me conclude my statement by merely saying that we have been working very closely with EPA, and we think there are significant opportunities to join with EPA and the State agencies concerned with sludge application activities, and we're very supportive of that. I would point out, however, that given the very best rules and regulations and so on that everyone can promulgate, there is still a crying need in the countryside to assist and help producers actually apply these sludge wastes to agricultural lands, and on-site assistance is appropriate in that respect.

Let me conclude my testimony with those remarks.

[The prepared statement of Mr. Bridge appears at the conclusion of the hearing.]

Mr. ENGLISH. Thank you, Mr. Bridge.

It might be helpful if we had Mr. Michael Cook come up and give his testimony, because I think probably a lot of the questions we're going to have are going to be similar or we'll be going back and forth. He's Director of the Office of Wastewater Enforcement and Compliance with the U.S. Environmental Protection Agency.

Mr. Cook, if you would be kind enough to give us a summary of your testimony, we would appreciate it, and then we can kind of get down to questions on it.

STATEMENT OF MICHAEL B. COOK, DIRECTOR, OFFICE OF WASTEWATER ENFORCEMENT AND COMPLIANCE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. COOK. Good morning, Mr. Chairman. I'm delighted to be here today.

I am Director of EPA's Office of Wastewater Enforcement and Compliance. My office is responsible for directing and overseeing the National Pollutant Discharge Elimination System, the program that issues permits for municipal facilities and for sludge, and also I'm responsible for the National Pretreatment Program as well. I appreciate the opportunity to address the subcommittee on H.R. 4360.

We at EPA are extremely interested in helping to ensure that sewage sludge may be safely and beneficially used on land. While we understand and appreciate your concerns on this subject, we believe that many elements of the bill duplicate several existing statutory and regulatory requirements. We also fear that by adding a substantial number of new requirements to the existing framework, the bill could actually result in discouraging the beneficial use of sewage sludge and disrupting successful economically viable programs for national marketing of sewage sludge.

EPA has a history of supporting beneficial use of sewage sludge. Processed sewage sludge is a natural fertilizer and is valuable for the organic nutrients it contains, as well as its ability to physically stabilize disturbed soils. Sewage sludge is utilized throughout the United States in virtually every type of usage that requires fertilizer or soil stabilizer, and I would note in this regard that about 60 percent of the sewage sludge that is generated in the State of Oklahoma is disposed on agricultural land in the State of Oklahoma.

It has been common practice for decades to use sludge in States other than where it is generated. For example, Houston, Texas, has been sending heat-dried sludge to Florida for use on citrus groves for more than 30 years. Milorganite, another heat-dried sludge product, has been sold throughout the United States for decades. Closer to home, all sludge from the District of Columbia's wastewater treatment facility—about 1,600 dry tons per day—has been beneficially used in Virginia and Maryland since the mid-1970's, with great benefit to farmers.

EPA has coordinated repeatedly and over time with other Federal agencies, including USDA, to issue policy and guidance fostering beneficial use. Although recent studies such as our national sewage sludge survey have shown the quality of sludge to be generally high, we recognize, as does Congress, that the beneficial use of sewage sludge requires controls. EPA is required under the Clean Water Act to regulate the use and disposal of sewage sludge on a comprehensive basis to address these concerns. Under EPA's interim sludge permitting strategy, permits issued by EPA and States to publicly owned treatment works include conditions related to sewage sludge, such as sludge quality monitoring and land application requirements, and additional requirements where warranted to protect public health and the environment. Nearly all States have existing regulatory programs to govern sewage sludge use and management as well.

EPA has invested years in developing a defensible scientific and regulatory basis for standards to control the use and disposal of sewage sludge, and this summer EPA will promulgate its long-awaited technical standards for the land application, surface disposal, and incineration of sludge. The final regulation will establish, first, risk-based pollutant limits to protect sensitive human and environmental pathways; second, requirements to control pathogens and vector-attracting properties of sludge; and third, management practices to guard against improper sludge application or site management. These requirements are expected to be tailored to the risks involved for each use and disposal practice.

We also expect the rule to contain notification, monitoring, recordkeeping, and reporting requirements to ensure that all parties involved in sludge generation, treatment, use, or disposal are aware of and in compliance with the standards.

Now, I have briefly described our program. I would like to discuss how some specific provisions of H.R. 4360 relate to what we are currently doing.

The legislation sets forth a system where sludge bound for application to agricultural land must be analyzed and determined to be safe. The application site must be determined to be suitable, and the rate, frequency, and method of sludge application must be approved. Our program includes similar controls: Pollutant limits in sludge; controls over the amount of pollutants that may be applied over a period of time; management practices; accounting for site conditions; and an option for considering site-specific criteria are all part of our program.

Under the proposed bill, the methods for applying the sludge to agricultural lands and for alleviating the effects of any spills must be approved. The proposed bill would also restrict application to

certain areas to protect surface and ground water. Our program would address these issues under management practice requirements, which would likely apply to all but certain high-quality sludge. The Clean Water Act and EPA's permitting regulations also provide broad authority to develop conditions on a case-by-case basis where additional controls may be necessary to protect human health and the environment.

The proposed bill also requires the party owning or controlling the sludge to agree in writing to be responsible for applying the sludge in compliance with any conditions on the application. Similarly, we expect our regulations to impose notice and information requirements on treatment works to inform the applier as to what is needed to comply with the standards. The applier is directly responsible for compliance with the standards and could be subject to additional requirements under a permit.

Under H.R. 4360, the landowner must grant authority for the Soil Conservation Service to conduct inspections. The Clean Water Act provides for EPA to oversee and inspect the use and disposal of sewage sludge.

Finally, while the proposed legislation sets forth a civil penalty system for persons who apply sludge to land in violation of the provisions, the Clean Water Act provides administrative, civil, and criminal penalties which, for the most part, are more stringent or cover more ground.

We recognize that the interstate transfer of sewage sludge poses some permittable challenges for all concerned parties. The creation of a rigid and potentially expensive approval process administered by another Federal agency as is envisioned under H.R. 4360 is, however, unnecessary, in our view. We believe that such a process would overlap with and, in some cases, could actually contradict EPA and State sludge management programs and that it is not justified by our current knowledge about the risks posed by land application of sludge. Furthermore, we believe that the proposed legislation could effectively halt the interstate transport of sewage sludge that is destined for beneficial use.

We also believe that the proposed legislation would have an overall chilling effect on beneficial use of sewage sludge anywhere by fostering a negative image of sewage sludge, thereby forcing less attractive sludge disposal options which offer no beneficial use opportunities and could actually be environmentally less desirable.

In conclusion, we believe that beneficial use of sewage sludge could be carefully regulated in a manner tailored to the risks involved. We should facilitate and encourage beneficial use of high-quality sludge to help the parties that generate the sludge and those who need an economic fertilizer and soil conditioner.

I'd be happy to answer your questions.

[The prepared statement of Mr. Cook appears at the conclusion of the hearing.]

Mr. ENGLISH. Thank you, Mr. Cook.

Dr. Chaney, do you have a statement or anything, or are you here to help us answer some questions?

Mr. CHANEY. That's it.

Mr. ENGLISH. Mr. Cook, in your testimony, on page 18, I believe I'm quoting here, "In any event, the appliers would be directly re-

sponsible for the application of sludge under part 503 of the regs." Is that proposed regs? Is that what you're coming with this summer? Or the existing regulations today?

Mr. COOK. The regulation that we are talking about here will be put out in final this summer.

Mr. ENGLISH. So you don't have it.

Mr. COOK. What is in place right now is an interim program. It includes a combination of Federal——

Mr. ENGLISH. So what you're talking about here, though, isn't in place.

Mr. COOK. That's right.

Mr. ENGLISH. This is just something you may come with this summer.

Mr. COOK. We will come with. We have a court order to do it.

Mr. ENGLISH. A court order. They had to make you do it by a court order? Is that what it took to get you to do the job?

Mr. COOK. This has been a very, very complex subject to deal with.

Mr. ENGLISH. Yes. Well, they all are. Let me go on. You say, "Under part 503 regulations and may be subject to additional requirements under a permit." Does that statement mean that the agricultural producer is legally responsible for any contamination that may result from a sewage application?

Mr. COOK. The way the regulation is structured, the person who is applying the sludge will either be permitted directly with obligations under the permit that will have to be met on application rates and things like that, or they will be indirectly subject to a set of permit requirements where they are utilizing the sludge on the land on behalf of someone who is directly permitted.

Mr. ENGLISH. Well, wait a minute. That's kind of complicated what you're giving me. What I'm asking you is, assume that we have this application applied and we come up with some kind of contamination that shows up later. Is that person who had sludge applied to his land legally responsible, then, for any contamination that comes about later on?

Mr. COOK. If permit violations have occurred or violations of our regulation——

Mr. ENGLISH. I'm not talking about permit violations. I'm talking about—let's say a year later you come out and you have water contaminated, and somebody goes back and points to that farmer up there and says, "Aha, it's Farmer Jones up there." Farmer Jones says, "Gosh, I don't know. I guess that must have come from that sludge they applied to my land." Is he legally responsible, or can they come back then and go to the people who applied the sludge?

Mr. COOK. As I understand the structure of your bill——

Mr. ENGLISH. I'm not talking about the bill. I'm talking about your proposed regulation.

Mr. COOK. What I said is that he is responsible if he has not applied the sludge in accordance with the requirements of our regulation and/or a permit that's issued to him. There are additional obligations under tort law which may apply as well.

Mr. ENGLISH. So the farmer may very well be responsible.

Mr. COOK. It's possible, even if he has complied with his permit, but it would not be under the Clean Water Act.

Mr. ENGLISH. But under your proposed regulation, the farmer may very well be responsible. That's what you're saying, right?

Mr. COOK. That's correct.

Mr. ENGLISH. Now, with regard to the regulation you're talking about you're coming with, this is part of this proposed regulation. As I understand it, and correct me if I'm wrong, you were first directed—or the EPA was first directed—by the Congress to deal with this subject back in 1977. Is that correct?

Mr. COOK. The latest amendments that were——

Mr. ENGLISH. I didn't ask you about the latest amendments. I asked you, did the Congress direct you back in 1977 to deal with this?

Mr. COOK. I'm not sure about 1977, but 1987 is the provision——

Mr. ENGLISH. Well, that was another direction you got from the Congress, but the first one came in 1977, did it not?

Mr. COOK. I'll have to respond to that for the record.

Mr. ENGLISH. All right. And then you got directed again in 1987 by the Congress.

Mr. COOK. Yes, sir.

Mr. ENGLISH. And you were supposed to have that done by 1988, right? That's when the regulation was supposed to be out, according to this directive by Congress?

Mr. COOK. Yes.

Mr. ENGLISH. And you didn't do it.

Mr. COOK. That's right.

Mr. ENGLISH. And then they finally took you to court.

Mr. COOK. Yes.

Mr. ENGLISH. And now, what, 5 years later, finally the court is twisting your arm, and supposedly you're going to come out with regulations this summer?

Mr. COOK. That's right .

Mr. ENGLISH. Who goes to jail if you don't do it?

Mr. COOK. The Administrator is liable.

Mr. ENGLISH. So they'd come down and cuff him and send him off to the pokey if he doesn't get it done. Is that what you're telling me?

Mr. COOK. That's the theory.

Mr. ENGLISH. Now, these regulations that you put together that you are going to propose 5 years after they were supposed to have been out or 15 years, I guess——

Mr. COOK. These will be final regulations.

Mr. ENGLISH. We'll finally get it 15 years after you first came to—I can assure you, since you don't know, it was 1977 when you were first directed to do it. So it's taken 15 years to get around to these, and you're finally getting the regulations out because the court's making you do it. Are these regulations, when they were drawn up, are they designed to deal with site-specific applications of sludge, or is this just kind of whatever the run-of-the-mill sludge is, you go out and you kick it out on the farmer's land, and that's the end of it?

Mr. COOK. The approach is that for each type of use of the sludge, we will have certain minimum requirements for sludge quality.

Mr. ENGLISH. You mean there are different kinds of sludge?

Mr. COOK. We're talking now about the content in the sludge that might be of concern when applied to the land or incinerated or landfilled in some fashion.

Mr. ENGLISH. How do we know what's contained in that sludge?

Mr. COOK. We're going to require a monitoring of the sludge quality for the contaminants of concern.

Mr. ENGLISH. What does that mean?

Mr. COOK. We will require that the sludge be analyzed for the contaminants that are likely or could possibly cause a problem when the sludge is applied to the land or otherwise disposed of.

Mr. ENGLISH. Are you telling me, then, that every load of sludge that comes out that's going to be used on the land is going to be tested by EPA?

Mr. COOK. The testing will be done actually by the utility that generates the sludge.

Mr. ENGLISH. The people generating it are going to be doing the testing.

Mr. COOK. Right. And they will be subject to quality assurance and quality control requirements that we have for that kind of testing and subject to penalties if they don't conduct the testing as required.

Mr. ENGLISH. Let's back up. I don't want to go too fast on this. I want to make sure I understand exactly how this procedure works. So we're going to have the folks who are producing the sludge get to test the sludge.

Mr. COOK. That's the way we manage almost all of our environmental——

Mr. ENGLISH. I know, but yes or no is all I'm after. You know, my time is short here. So people that produce the sludge are going to test the sludge. What if it turns out that their test shows maybe there's some funny material in here that doesn't quite measure up? What do they do with it then?

Mr. COOK. If their test showed that it exceeds some of the limits that we have placed on the disposal or the use method that they have in mind, then they cannot use or dispose of it in that fashion. They have to do something else that does fit within our requirements.

Mr. ENGLISH. Well, what would that be?

Mr. COOK. Right now, for example, the restrictions on landfilling of the sludge are and will be less stringent than those for land application on agricultural land.

Mr. ENGLISH. Will be less stringent.

Mr. COOK. Yes.

Mr. ENGLISH. What's the cost difference?

Mr. COOK. The cost difference between landfilling and land application?

Mr. ENGLISH. Yes.

Mr. COOK. It's a very site-specific question.

Mr. ENGLISH. Is it safe to say that it is more costly to go to one of these landfills that accepts material that does not meet the limits of the material that will be applied to the land?

Mr. COOK. Typically, if you actually have the sludge on-site, it will be less expensive, but there is a question about transport costs.

Mr. ENGLISH. Yes, you've got a little problem on that. All right. So in effect what you're telling us is it will be less expensive, so it's going to cost them money if they find any of these materials in there and they've got to dispose of sludge other than applying it to the land. That's where they're trying to put most of it, right?

Mr. COOK. Right now about half of the sewage sludge is applied to the land. It's a little higher in Oklahoma, as I mentioned.

Mr. ENGLISH. Well, we've got good, clean sludge in Oklahoma. There's no question about that. [Laughter.]

But the point that I'm making is, one, you've got a lot of differences in sludge. There may very well be materials contained within that sludge that makes it unsuitable to apply to the land. If I understand you, under the proposed regulations of EPA, you're going to leave it up to the people who are producing the sludge to determine whether or not in fact it contains any of these materials. If they find that it is, it's going to cost more money to dispose of it in some other way. Is that a fair statement?

Mr. COOK. I would repeat that they are subject to very tight controls when they do their own——

Mr. ENGLISH. I understand. You're going to go in and check them. Well, we've seen that. Now, let's assume, carrying this through, that this material that the utility has inspected and certified and said this is all safe, we ship it out to North Dakota, and we're going to apply it to the land out in North Dakota. We're going to apply it to hundreds of acres, thousands of acres. I guess if you're talking about New York City, it would be thousands, wouldn't it? Thousands of acres would be involved, right?

Dr. Chaney, isn't that right?

Mr. COOK. It all depends on how much you send from New York City there.

Mr. ENGLISH. What?

Mr. COOK. It depends on how much you send from New York City there.

Mr. ENGLISH. Well, they can't dump it in the ocean anymore, and you can't use it on New York land. What are you going to do with it?

Mr. COOK. Well, actually, New York is trying to develop a market for their heat-dried sludge in the State of New York——

Mr. ENGLISH. But they haven't got it, have they?

Mr. COOK. They don't yet have it.

Mr. ENGLISH. So right now it has to go shipping out someplace else. We apply that on several thousand acres out in that land, and we end up with—we're going to produce some beef and we're going to produce some wheat and we're going to produce some other products, and we end up with, let's say, the French or the Common Market, who says:

> You can't bring that American beef in, because that American beef has been produced on land, or may have been produced on land, on which sludge was applied, and that sludge may very well have contained materials that will be hazardous to the public, and therefore, we are going to prohibit the importation of American beef.

Now, how can you provide the Department of Agriculture or provide the American family farmer with the scientific data that proves in fact there has not been any questionable material applied

to those lands and, therefore, this would be a false accusation? How do we deal with that?

Mr. COOK. Well, the sludge that is applied on the land under the conditions that you've described, we would know both its quality and the conditions under which it was applied to the land.

Mr. ENGLISH. How would you know that?

Mr. COOK. Because of the monitoring of the sludge that was conducted.

Mr. ENGLISH. You didn't inspect it, did you?

Mr. COOK. We may inspect some of these sites.

Mr. ENGLISH. I didn't ask you—I said, did you inspect the sludge? Can you swear on a stack of bibles in a court of law that, hey, absolutely no material that exceeded the limits that have been outlined in the regulations of EPA has been applied to that land?

Mr. COOK. There is no inspection program that could be designed by man that would provide that kind of assurance.

Mr. ENGLISH. But you can provide as close to that assurance as you can get when you've inspected every load that comes out there and is applied there, can you not?

Mr. COOK. You're still only going to take one sample out of a load.

Mr. ENGLISH. Take one sample out of the load. How many are you going to take?

Mr. COOK. It depends on the inspection regime involved.

Mr. ENGLISH. You're going to let the folks that produce it inspect it, the ones that are going to lose money if they find anything wrong with it inspect it, and you're going to hopefully monitor it in some way.

Mr. COOK. We will specify the monitoring requirements in considerable detail as well as the quality assurance requirements, and there will be legal penalties that can be imposed if they violate those requirements.

Mr. ENGLISH. That may not be good enough to protect American agriculture.

Mr. COOK. EPA and the States will also have the full authority to go and take samples themselves to conduct inspections to make sure that they are actually complying with the requirements.

Mr. ENGLISH. Well, now, how many people—since you brought that up, we'll get into that a little bit. Each State has different rules and laws, right?

Mr. COOK. Yes. What will happen over time, after we put our regulations——

Mr. ENGLISH. That isn't what I asked you, Mr. Cook. I'm talking about today. Now, like I said, you've been supposed to do something about this since 1977, and you all hadn't done anything about it, and now you're telling us, "Well, sometime down in the future maybe something's going to be done." The way it is today, as far as sludge is concerned, each State has its own laws. Do some States have no laws governing sludge?

Mr. COOK. Virtually all the States have——

Mr. ENGLISH. I said are there any States that do not have laws governing sludge?

Mr. COOK. I can't say with confidence that every State does, but virtually every State does.

Mr. ENGLISH. But as far as those States are concerned, then what level of inspection do those States carry out?

Mr. COOK. It varies from State to State.

Mr. ENGLISH. And it depends on the resources of the State.

Mr. COOK. It does.

Mr. ENGLISH. And it depends on whether the States are looking at it from the standpoint of concern over what may leak into the water as opposed to what may be applied to the land. Are there any States, to your knowledge, that are looking at sludge specifically from the standpoint of protecting American agriculture?

Mr. COOK. Yes, I think to the extent that they are involved with agricultural application of sludge, and almost all of them are.

Mr. ENGLISH. I'm talking about inspecting it specifically from the standpoint of American agriculture, any State that you know of.

Mr. COOK. Yes.

Mr. ENGLISH. What State?

Mr. COOK. Virtually every State that is involved in regulating the agricultural——

Mr. ENGLISH. Mr. Cook, I don't think that's right, because I can tell you one that, to my knowledge, is not, and I bet you there are a lot more. I don't think my State of Oklahoma looks at it in that way.

Mr. COOK. I think it does, sir.

Mr. ENGLISH. We've received no information talking about the application of sludge which anybody in the State of Oklahoma is going to be out inspecting that land, going to be determining what kind of soil it's going to be applied to and whether it can be applied safely. There isn't anybody that's going to come out there and inspect every load of sludge that's applied to that land. They're not doing it now, and they're not planning on doing it in the future.

Mr. COOK. What you've just described is one program for controlling the agricultural use of sludge, but there are other programs, and I think the State of Oklahoma has a different program, and I would be happy to describe that for the record.

Mr. ENGLISH. I'll check with the State of Oklahoma, but to my knowledge, they do not have anyone on-site with the application of sludge to agricultural land.

Mr. COOK. I don't think you necessarily have to have someone on-site to ensure that the use of sludge on agricultural land is proper, and I don't think your bill actually proposes to have someone on-site.

Mr. ENGLISH. As far as the inspection of any load that's going to be applied, that's what the bill applies to.

Mr. COOK. That is not what I read in the bill. I mean, that is a possible interpretation of the bill, but——

Mr. ENGLISH. I guarantee we'll be happy to clarify it for you. If you think it needs to be clarified in that area, I'll be happy to strengthen that. The point that I'm making on this is you're giving us assurances someone's going to monitor, someone's going to check on it. As we have seen in the United States, waste has become big business, big dollars, big money, and we're talking about the application of sludge is becoming big money, and it's costing a lot of money to dispose of that material that cannot be handled cheaply. So you're in effect leaving the checking to the

very people who have the economic incentive not to find anything wrong with it, and the EPA is generally going to monitor, and we've seen over the years an awful lot of waste dumped around this country that supposedly was not dangerous, according to the EPA, that supposedly did not do damage, only to later discover that perhaps some errors were made.

The economy of American agriculture is obviously very sensitive, and it's one that is critical, and quite frankly, I'm not sure that it's good enough for the EPA to promise us that somewhere down the road, maybe next summer, they're going to come out with some rules and regulations 15 years after they're supposed to deal with a particular problem on this basis, to monitor the people that have an economic interest.

Mr. COOK. I have provided information in my testimony on the agricultural use of sludge, which has gone on now for more than 50 years in parts of the country. This is a very well-established practice. As I said, it's well-established in Oklahoma, and I don't think that the kinds of potential adverse impacts that you're describing have actually occurred. As a matter of fact, we have done a review of the record on this over time and find that the cases of problems created by agricultural use of sludge are actually quite limited.

Mr. ENGLISH. The point is, we have never, though, gotten into the situation in which we're talking about transporting sludge halfway across the United States. Most of the sludge that is applied comes from within the State in question, and the State handles it, they know exactly what's happening with regard to the plants that are in question. In this case, there is not going to be that kind of assurance, and when we start talking about shipping large volumes, train loads of sludge across this country to be deposited on land, sludge that originated from, in many cases, people are not going to know from where, and depending on a system that requires the people who have the economic interest in it to do the testing and hopefully being monitored in some way by the EPA, that's putting the economy of American agriculture at risk.

Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

Mr. Cook, it's no secret to anybody that the EPA is not exactly Horatio at the bridge defending agriculture, so there's a question that arises, and I join the chairman, about how best to manage this situation, and, Mr. Bridge, we understand perfectly the intricacies of internal warfare in any administration. Yet I want to ask Mr. Cook a few questions and then ask Dr. Chaney about his experiences in other areas, simply because, as was implied, now if a farmer has to have a plan for conservation compliance, coastal zone planning, sodbuster laws, swampbuster laws, wetland reserve programs, pesticide recordkeeping, nutrient management plans, to be joined, I'm sure, with clean water regulations and probably in the Endangered Species Act on top of it, the question that I continue to have is: Under EPA rules and regulations, another overlay, how is a farmer supposed to be informed about his liability in the use of sludge in your proposed rules and regulations?

Mr. COOK. The permit holder, in the process of getting the permit, will have to describe how and where the sludge is going to be managed——

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Mr. SMITH. Permit to whom?

Mr. COOK. And the permit will go to the person who is actually processing the sludge for ultimate use. But they will have to describe where that sludge will go and how it will be done——

Mr. SMITH. If it's a New York producer of sludge, a utility, and it goes to Oklahoma, a farmer will have to get a permit from the New York producer of sludge.

Mr. COOK. The New York producer of sludge will have to have an arrangement with that farmer, and in the process of issuing the permit to the New York producer, we will ensure that that farmer is involved in the process of commenting on the permit.

Mr. SMITH. You know, that in itself is so awkward and so almost ridiculous that—and that's what we're trying to get at here.

Mr. COOK. We also have the authority——

Mr. SMITH. We're trying to get at the question of how you can apply sludge without overregulating the process, and the point made here that you have not discussed—both of you oppose this piece of legislation. The only organization that is involved in every county that farmers can rely upon for direction and discussion about the application of all these myriad of Federal laws is the SCS group, the Soil Conservation Service people, already organized, already there, so you're opposing legislation which would allow the Soil Conservation Service, the one closest to the farmer, to help him go through this entangled web of regulation. Why are you doing that?

Mr. COOK. We are not opposing assistance from the Department of Agriculture to farmers at the local level. In fact, they currently have a very active and supportive program, which we——

Mr. SMITH. In your rules and regulations, are you going to identify the fact that the SCS or somebody in the Department of Agriculture can be a consultant, can be asked to participate in what you may provide as rules and regulations?

Mr. COOK. In our guidance, we will certainly urge that people work closely with USDA.

Mr. SMITH. Well, EPA could never do that, right? The Environmental Protection Agency does not have people on the ground in every county. You have in some cases regionalization of your organization. How in the world could you ever get to the point that you're advising farmers? You couldn't, could you?

Mr. COOK. I was actually trying to endorse your idea of working with USDA, for whom we have high respect, and we feel that they are good advisors that are accessible at the local level to farmers, and we will encourage that farmers work actively with them on sludge management, as they have in the past.

Mr. SMITH. Dr. Chaney, you see the concern that I have and also evidenced by the chairman. We're worried about not so much the fact that this ought to be regulated, obviously. We're worried about how it will be applied, and reasonably and judgmentally, so that we don't create another morass of regulations and overindulgence and hands-on management. I'd like to have your thoughts about—your information about how this works in other parts of the world and maybe this country at the moment.

Mr. CHANEY. I think we do have to recognize what's working in place today and try to understand how that can work in the new

rule that EPA is trying to finalize now. I think the farm community has had the assistance of SCS and Extension Service, through the States, providing agricultural advice about use of sludge. I think that that has provided a level of protection much greater than EPA had in place during the last 10 years since the 1979 rule. For instance, in Oklahoma they adopted the agricultural recommendations in their State rule that were not part of the Federal rule, and within the new rule, States can continue to impose regulations more stringent or different than those that EPA requires on a national basis.

I agree that it is frustrating to those of us in the agricultural community about how EPA, with a regulation in Washington, with its new part 503 system, will be able to provide the level of assurance at the farm that some cities have found necessary to maintain the best programs. The best programs include independent monitoring of sludge composition, independent monitoring of application, involve States having adequate staff to actually mark the parts of the field that are approved for sludge and those which are not approved for sludge; other States obviously do not have that level of staff. Some States even hire consulting firms to go through the paperwork because they don't have any staff even to look at the paperwork anymore.

It is a problem, and I'm personally concerned about how we're going to go from the system we have today to this new system, with the States not having staff to do most of the things that you and the chairman have concerns about. However, I completely agree with our departmental position announced this morning that we believe this should be done through EPA and the States, continuing to have SCS, Extension Service, and ARS working with the States and their Extension Service programs to advise both the farmers, the State health department and environmental department people, and EPA in enforcement of this kind of program.

Mr. SMITH. Dr. Chaney, thank you for those thoughts. Beyond that, it bothers me somewhat as to how the liability will apply under these new rules and regulations. Where will the liability rest? Very frankly, I don't want to shift a huge liability to the farmer, who has limited or, in some cases, no knowledge of the content of the sludge that he may or may not use on his farm. So do you see a problem with this question of liability? Maybe this is not important.

Mr. CHANEY. The question of liability has very many people uneasy, it's true. I want to give one example of a problem that occurred in the past, before we had any regulation. Remember that we had been applying sludge—both of us have given examples of 50- and 60-year-old programs that are organized in Houston, Milwaukee, and in many other cities. Occasionally, there were very bad sludges that were used before we developed the regulatory program in the late 1970's and the advisory program starting in the early 1970's.

I want to state strongly that I think that the analysis of risk and so on conducted for the part 503 rule is extraordinarily complete and comprehensive, and we don't expect to be surprised by contamination problems, barring the people deliberately mixing haz-

ardous materials into the sludge, which the chairman is also concerned about.

Mr. SMITH. After it leaves the plant, you're saying?

Mr. CHANEY. Yes.

Mr. SMITH. OK.

Mr. CHANEY. That's something that I can't deal with.

Mr. SMITH. That's right.

Mr. CHANEY. I want to give this one example, because I think it still says that the person that caused the problem will end up being liable, the way that most things work in the United States. We have an example, a very tragic and unfortunate example, in St. Marys, PA, where a major industry dumped cadmium sulfide in the sewer. Nobody even knew what to analyze to analyze cadmium sulfide at the time when this was going on. The sludge was used as a resource because of the organic nitrogen and other desirable benefits of the sludge, and it contaminated the soil in a way that would prohibit or prevent any use of that land for vegetable crops or housing development and so on.

Mr. SMITH. Forever?

Mr. CHANEY. For the foreseeable future. It should not be used without some remediation, and remediation treatments are still being identified, trying to find some other than removing the contaminated soil, although contaminated garden soils were actually removed. This is one of the worst that I know of, and we honestly believe that the regulatory and advisory programs will prevent this from happening again. But the farmer sued the city, the city sued the polluter, and the polluter is paying for the corrections, and that's the way the system works. Even though we don't say that there's a liability system for sludge, it's always there in our common law.

Mr. SMITH. Well, just quickly a followup on that, it seems to me that somewhere, however, the farmer ought not to be responsible for the manufacture of sludge problems. So if there's an inspection and a grantee by EPA at the source, then the farmer's responsibility ought not to be for the chemical makeup of the sludge, it ought to be for the application, and if there's an SCS write-off on the application, the farmer ought not to be responsible liabilitywise for either the chemical content or the application, if it's done properly. So he ought to be exonerated from liability, but he can't be exonerated unless somebody within the county helps him determine the amount of sludge to put on, where to put it on, and what soils he can and cannot use, it seems to me. Does that make sense?

Mr. CHANEY. I think the issue of who has liability and all those are complex issues that I don't want to speak to. The power to have adequate sampling and independent analysis and a valid program of laboratory assurance is a critical part of the program that's needed in this country, and EPA could make that program but does not have that program in place at this time.

Mr. SMITH. Thank you.

Mr. ENGLISH. We're very pleased to have with us the ranking minority member of the committee and the former ranking minority member of the subcommittee, Mr. Coleman.

Mr. COLEMAN. Thank you, Mr. Chairman.

Mr. Cook, I'll be addressing my question to you. As I understand Mr. English's proposal, he's concerned about farmer liability, which Mr. Smith has just followed up on. But, I think a bigger question that this raises is a question that I want to pursue for a moment. I am talking about the quality of our food, and the safety of our food in this country. I think these issues have even a wider degree of interest from perhaps people off of our committee. Everybody has a concern about the quality of the food that we consume, and as Mr. English said, certainly we export a lot of food, and people in the international realm are concerned as well.

My question is not so much about sludge. I think we have gone over that territory, but the same questions arise when we have a hazardous waste facility that is located close to and in proximity of a food processing plant. My question to you would be: Is there currently any procedure set up within EPA or by any State that you have knowledge of which takes into consideration specifically the impact upon a food processing plant that's located in proximity of, let's say, 5 to 10 miles downstream from, a hazardous waste facility?

Mr. COOK. Yes, sir, there is. Generally, when we write our regulations to manage hazardous waste, we take account of all possible pathways by which that hazardous waste might eventually impact human health or the environment, including surface water, ground water, air, and soil migrations of one kind or another. So if that facility is following the requirements of our regulations, the chances are that there will be no impact on that food processing facility nearby.

Mr. COLEMAN. All right. Now, you say the chances are. What are the chances, then?

Mr. COOK. We generally have built our regulation on worst-case assumptions, so that the chances, if they are complying with the permit, would be close to no chance at all of contamination.

Mr. COLEMAN. If they comply with the permit. Now, this obligation and responsibility you have granted to the States? Is that correct?

Mr. COOK. I don't know the exact number now. It's in excess of 30 States that have responsibility for administering——

Mr. COLEMAN. I believe Missouri is one of those States. Is that correct?

Mr. COOK. I'm not sure. I've been out of that program for almost a decade now.

Mr. COLEMAN. The hazardous waste permitting process?

Mr. COOK. Yes.

Mr. COLEMAN. Well, let's assume that a State has that authority from you. The EPA ensures that the State is following and complying with all of its regulations regarding the standards that are in place.

Mr. COOK. We have a program that tries to ensure that the States are implementing the program properly.

Mr. COLEMAN. And you take into consideration the health and safety issues, I think. At least, health you just mentioned.

Mr. COOK. Both health and the environment.

Mr. COLEMAN. Health and the environment. What do you mean by the environment?

Mr. COOK. What we're talking about there are impacts on biological organisms and other—it's basically flora and fauna.

Mr. COLEMAN. All right. Well, if I've got myself a food processing plant that is taking in water downstream from a waste facility and the water smells bad and tastes bad, and I have to incorporate it into my product, would that violate any EPA rule or regulation? It may have no impact on health or the environment.

Mr. COOK. It's possible that whatever is contaminating that water and causing the bad smell is violating a regulation. You'd have to go back upstream. So far as regulation of the food processor itself, that would be the responsibility of the Food and Drug Administration.

Mr. COLEMAN. Well, now, you didn't answer my question. Something could smell bad and taste bad—in fact, the water in Washington, DC smells bad and tastes bad, but I assume that you all have approved us to drink it.

Mr. COOK. There are a lot of naturally occurring contaminants that are within the realm of——

Mr. COLEMAN. Well, these aren't going to be natural in the sense that a hazardous waste facility has created a source for these things.

Mr. COOK. If the hazardous waste facility is causing a problem with the water supply which is an endangerment to human health, then——

Mr. COLEMAN. Well, no, it's not an endangerment to health, but it stinks and it tastes bad, and I employ 600 people at this plant, but all of a sudden no one wants to buy my product because it stinks. Now, I'm asking you, is there a regulation in place or a law that says that it's OK—that there's anything that's going to hold that up? Right now you're really telling me, no, there isn't, because it doesn't have anything to do with health or the environment. Those were your two standards that you mentioned.

Mr. COOK. That's right. We have, I think, on occasion utilized our authorities to go beyond that for issues like odor, but I don't know the exact circumstances of this case.

Mr. COLEMAN. And you think that this would be the Food and Drug Administration's interest, not anybody else's?

Mr. COOK. What goes on inside the food processing facility would be the concern of the Food and Drug Administration.

Mr. COLEMAN. Would it have anything to do with the Food Safety and Inspection Service at USDA?

Mr. COOK. It possibly could.

Mr. COLEMAN. Do you think it's important for you or the State permitting agency to know about the impact that such a facility might have on the food processing plant? Do you think that's important?

Mr. COOK. Yes, I think that is something that should be taken into account when the permit is issued.

Mr. COLEMAN. And is there anything in rule or regulation now that would require that?

Mr. COOK. There is certainly latitude in the permit processing to take account of the circumstances surrounding the potential permittee, and it is, I think, a fairly typical practice to do so. We have

an opportunity for notice and public comment and make adjustments in the permits accordingly.

Mr. COLEMAN. But I don't think it's required, and I think it also would be allowed to just gloss over it and still be approved.

Mr. COOK. I described the theory of the way we have established our regulation, which is that nothing gets off-site that would adversely affect human health or the environment.

Mr. COLEMAN. But it could taste awful and it could smell bad.

Mr. COOK. Well, we hopefully would not have that result.

Mr. COLEMAN. Well, that would be nice and it would be hopeful.

Mr. Chairman, I thank you. My line of questioning is a little bit different. I think that what we have here and what you have brought to the attention of the subcommittee is a growing concern in rural America: That a lot of hazardous waste, sludge, or a lot of byproducts from a lot of people, from a lot of places, are being dumped in rural America. In some cases, this may be an advantage, as sludge, I guess, is considered, to be a place to dump our solid waste, which it is not. I think we have some serious questions about the ramifications to our food chain and to the perception of public health and safety.

I think Mr. English raises a very good point. You give anybody in this world a reason to refuse at the border American farm products, and they will look for it, because we are basically so competitive that they have to drum up charges on us, if you will. This is another example where we're trying to export in a high-value area worldwide, and there are going to be people raising these issues. Our regulatory agencies and we in the Congress better be prepared for them. I am looking to this as kind of a matter regarding food processing in general and our competitive situation in particular.

Thank you, Mr. Chairman.

Mr. ENGLISH. Mr. Stenholm.

Mr. STENHOLM. Mr. Cook, how do you define high-quality sludge? You say on page 8 of your statement: "We believe that the high quality of sludge that we are finding is attributable in no small part to the success of the national pretreatment program." How do you define high-quality sludge?

Mr. COOK. It's basically by the content of constituents that might potentially be of concern when you're managing or disposing of the sludge, such as metals, certain organic compounds, things of that kind. What we've found in that——

Mr. STENHOLM. What are the standards you use to judge the quality?

Mr. COOK. What we have now is a very elaborate system that's based on risk to people who might, under a very worst-case scenario, be exposed or ecological exposures of some kind or another that might occur with adverse impact on the environment. This risk-based approach to analyzing constituents of concern has been worked out, among other things, with close consultation with the Department of Agriculture.

Mr. STENHOLM. Are there tolerance levels that you operate within? Are there some metals or some products or some entities that if you find any of it, it's unacceptable, or are there tolerance levels that have been established?

Mr. COOK. I think up to this point, we're basically operating on tolerance levels. What we've done is we've looked at 14 different pathways of possible exposure of the sludge to humans or to environmentally sensitive organisms of some kind, and we have then analyzed just what levels might be of concern for different constituents by those different pathways, and we're now in this final rule that we're about to put out that is going to establish controls on the sludge that reflect the results of that risk assessment.

Mr. STENHOLM. Do you anticipate that there will be a zero tolerance for anything down the line at this stage of your investigation?

Mr. COOK. Not right now, no. Though I would anticipate that we would end up with virtually no pathogens for some types of management practices.

Mr. STENHOLM. Thank you.

No further questions.

Mr. ENGLISH. Mr. Nussle.

Mr. NUSSLE. Thank you, Mr. Chairman.

I was going through your statement, Mr. Cook, and looking at what your specific objections to Mr. English's bill would be, H.R. 4360, and by and large it appears that your specific objections are that they duplicate what is intended, at least, in the—or what you believe the final regulations will look like. Is there anything in Mr. English's bill that is not going to be part of the final regulation?

Mr. COOK. Well, our regulations are going to be risk-based, which means that for certain high-quality sludges, very high-quality sludges, we will have fewer controls than are imposed by the chairman's bill. So in that respect, there is a substantial difference.

Mr. NUSSLE. Is that the only difference between what you believe the final proposed regulations will look like and the bill before us?

Mr. COOK. If you look at the spirit of the bill—that is, to try to regulate from a kind of generation to ultimate management point—we are taking account of those same steps in the process when we develop our regulation and coming up with a risk-based approach for trying to ensure protection at every single one of the steps, and I believe that his bill is also doing that.

Mr. NUSSLE. So that's duplicating what you are trying to do.

Mr. COOK. Exactly.

Mr. NUSSLE. Is there anything else that is not—I understand the duplication. Is there anything that is going to be in the proposed regulations besides your standards for high-quality sludge that will be outside Mr. English's bill? Is there anything else that is not duplicated and that you feel is either necessary or unnecessary that you object with Mr. English's bill?

Mr. COOK. I think the chairman has mentioned that his bill actually requires the Federal Government to do the monitoring, the U.S. Department of Agriculture, whereas our approach would depend largely on self-monitoring with occasional inspections and review of records and perhaps some occasional monitoring by EPA or State personnel.

Mr. NUSSLE. Anything else that you would either have objection to or that you think has gone too far? Anything else in the bill?

Mr. COOK. I think also that there are extensive regulatory responsibilities assigned to the Department of Agriculture, and they are not a part of the program that we have in mind. Our program

will certainly encourage advice, technical assistance, and support from the Department of Agriculture but rarely, if at all, will actually involve the Department in regulatory activities.

Mr. NUSSLE. I think that's what Mr. Smith was getting at as well. Can that be arranged? Can we arrange for that kind of cooperation to alleviate that concern that we have over the involvement of the EPA directly with farmers and try and transfer some of that technical assistance to USDA and to SCS?

Mr. COOK. I think we already have a great deal of that, and we certainly would encourage and support more of it.

Mr. NUSSLE. Thank you.

Thank you, Mr. Chairman.

Mr. ENGLISH. Thank you, Mr. Nussle. I appreciate that.

Mr. Bridge, could the manner of the application of sludge to farmland affect the farmer's compliance under the conservation plan?

Mr. BRIDGE. Yes. One of the concerns we have is a proliferation of various kinds of requirements now being imposed on producers out here. I think Mr. Smith ticked off a number of those plans. It's pretty easy to confuse producers and cause all kinds of complications out here—for instance, we had a case, I think, here in Virginia where sludge was applied to the land, it was required to be incorporated and so on because of perhaps odor problems or whatever, and the compliance plans required certain levels of residue and so on, so the person got themselves out of compliance in terms of some of the farm programs. So there is a crying need out there to begin to integrate these requirements into a holistic approach and develop single-type plans to help producers and so on.

Mr. ENGLISH. Has the EPA consulted with you all as far as these regulations are concerned to make certain that the standards are in fact in compliance with the conservation plans that are required under the farm bill?

Mr. BRIDGE. Well, we've had a tremendous amount of interagency cooperation, work, et cetera, with the EPA on things like coastal zone and nonpoint source activities and so on as it relates to clean water activities. I would characterize that as being one of our cooperative kinds of things. We're not fully involved and engaged in certainly the regulatory side of that. In terms of working out the rules and regulations related to sludge, the Department of Agriculture has been deeply involved.

Mr. ENGLISH. Are you saying yes or no, the Department of Agriculture has been told in fact that the final rules and regulations will make certain that the application is in compliance with the conservation plans?

Mr. BRIDGE. No, I didn't say that.

Mr. ENGLISH. I didn't think so.

You also state that the Department, and I'm quoting here—I'm paraphrasing, I should say—that the Department believes that one comprehensive resource management plan for farmers, and this is a quote, "That would meet all of the pertinent environmental requirements is vital to American agriculture." Is that correct?

Mr. BRIDGE. Yes, that's exactly right, and it's back to the previous statement that I made that we need to begin to integrate into——

Mr. ENGLISH. Is there a commitment from EPA to the Department of Agriculture that in fact these regulations would be compatible with that goal?

Mr. BRIDGE. Not that I'm aware of in terms of the total context that we're talking about, and this is something that we've picked up perhaps more recently in our concerns as we saw the 1985 farm bill, the 1990 farm bill, et cetera, proliferating a number of different incentive programs even. We've got water quality improvement programs, we've got compliance requirements out there, we've got the wetland reserve, the conservation reserve, and so on that's leading us all toward separate kinds of programs as we deal with the individual producer. Trying to get that together within USDA is a real challenge, and obviously, we haven't done it with EPA to this date.

Mr. ENGLISH. Dr. Chaney, you're a real expert in this field and have studied for a long time. Different soils can accept and require different kinds of applications. Is that not true? Some soils can handle more metals than other soils can and so on and so forth? In other words, not all soil is alike. Is that correct?

Mr. CHANEY. Not all soil is alike, not all sludge is alike. Certainly the management recommendations are adapted to the sludge nature and the nature of the soils; the rainfall; the tillage requirements; and all the things in the advisory program. But these are different than the regulatory program.

Mr. ENGLISH. So in effect what you're telling me is that the regulations, as far as you're aware of, the final regulations that EPA will be coming out with, there is in fact no requirement in there or it does not address the fact that you need to marry up the kind of sludge and the material in the sludge with a particular soil condition, environmental conditions at a particular farm?

Mr. CHANEY. I don't want to agree completely with that. I think I need to make it clear that the regulation was developed so that in a worst case—that is, the worst combination you could make—it still couldn't be allowed to cause a problem with fertility or food safety. And that, I think, may be more restrictive than you had expected.

Mr. ENGLISH. Well, what I'm doing is going beyond this. I'm looking at it from the standpoint of agriculture and farmers, and as you point out, we have different kinds of soils, different weather conditions, we have different kinds of sludge. It would appear to me that idealistically it makes a lot of sense to try to marry up the contents of a particular sludge with a particular farm.

Mr. CHANEY. I think that traditionally that has been done at the State level.

Mr. ENGLISH. Right.

Mr. CHANEY. Again, with the Extension and university and SCS advising the State regulatory department, be it health or environment, that EPA gives power of regulation of sludge to. And I think those kind of goals can continue to be done that way, although I agree completely that most States do not provide sufficient human resources to do the job of inspection that you feel would be more appropriate.

Mr. ENGLISH. OK.

Mr. CHANEY. That's a State problem, and if EPA expects with part 503 to pass this through the States, as I know they do, with no money, it will still be a deficiency in the program.

Mr. ENGLISH. And could be a very serious deficiency in some cases.

Mr. CHANEY. Only with the unscrupulous operators, yes.

Mr. ENGLISH. And unfortunately, we've got those. Any place there's a lot of money involved, we always attract the unscrupulous.

Mr. CHANEY. But there are some remarkably wonderful programs out there, too.

Mr. ENGLISH. And there are some remarkably wonderful people, but it's always the few.

Taking this another step further, looking at the environmental conditions that we find this country in and the demands that are being made in particular as far as the American family farmer is concerned, going beyond just sludge, but looking at the applications of fertilizers and pesticides and all the other applications that farmers make as far as trying to meet the needs of their particular farm that have come under attack by many within this country, many demands are being made. We talk about the conservation plans that are being required.

Am I correct in saying that just as we talked about different farms really need different applications of sludge, if you're talking about using sludge, different materials in sludge, some farms can accept more of sludge that may contain a particular material than other farms can, that same thing is true when we talk about pesticides and fertilizers and all the others? It depends upon a particular farm, the environment, the conditions that we find, so that as we see this country moving toward a paintbrush, across-the-board approach to this particular fertilizer or this particular insecticide, that's really just kind of hitting an average, most likely, or it may be hitting the low end. There may be a lot of farms that can be safely used without any danger to the environment. There may be some farms that it will be used on that it will still be a danger to the environment. Is that correct, Dr. Chaney?

Mr. CHANEY. I think we have to remember that our regulatory programs both for pesticides and for sludge in particular are directed at the worst identifiable situation and protect that one, which then, by protecting the poorest soil to put sludge on from the sludges that might be available, we protected those that could accept much higher amounts excessively but completely. Again, that's why it's so important to have Extension Service and State programs, because they provide the farmers soil-specific, climate-specific advice about all parts—fertilizer, pesticides, sludge, manure, and so on. I guess the high degree of protection offered by this new rule, which, when it comes out, will be very important in providing the level that you expect that agriculture should demand, and agriculture does that through working with EPA.

Mr. ENGLISH. Can I stop you right there? Tell me what's wrong with what I'm going to outline here. Given all the environmental demands that are being made on farmers not just in sludge, but in pesticides, fertilizers, the whole gamut, all the way across the board, looking at it not only from the farmer's standpoint but from

the citizens of this country, does it not make sense to approach each farm, for environmental purposes, in the same manner in which we approach it from a conservation standpoint—namely, that it be the soil on that farm, the weather conditions in that area that will determine what applications can be safely applied, no matter what it is that we're talking about?

Mr. CHANEY. That's always our general advice, yes.

Mr. ENGLISH. Now, if that is the case, does it not make sense then, if we're going to move in the direction to meet the goal—and I think it's a very good one—in which we have a comprehensive resource management plan for farmers that will meet all the pertinent environmental requirements, does it not make sense that that be rooted in this approach to each farm standing on its own, based on the soil conditions and environmental conditions around that farm? Is that the only way in which we can truly approach this thing in a logical and rational way?

Mr. CHANEY. That certainly appears to be the most logical approach.

Mr. ENGLISH. If that is the case, then—and as I mentioned in my opening comments, the approach to sludge is really only a means at getting at a particular problem that I think is much broader, and that is to move the Department of Agriculture and the Environmental Protection Agency, hopefully, and the Federal Government into addressing the problems that we have in agriculture and the demands that we know are coming, additional demands that will be made on the American farmer on a site-specific basis.

Mr. CHANEY. I believe that that can be done with the intent of part 503, and if there are any deficiencies that are left when they actually produce this final rule, those could then be addressed subsequently. I think the system works really well, but it doesn't work because of EPA-Washington enforcing everything from the desk down here. It works because the States work with the agricultural community and the health community to provide site-specific advice and limitation. Remember, the fertilizer applications that come from sludge are regulated; it says you have to limit application to the fertilizer requirement. That means the system works with SCS, Extension, working with the State people to set limits for those particular fields, those soil series, and it works pretty well.

Mr. ENGLISH. Mr. Cook, is there objection in the Environmental Protection Agency to approaching environmental questions pertaining to the American family farm or to any farm on a site-specific basis?

Mr. COOK. No, I think that we would strongly encourage that approach. As I think has come out in this testimony, our regulations tend to be based on worst-case situations, which provide protection even under the worst conditions. In the case of our forthcoming sludge regulations, I anticipate that there will be a possibility on an individual farm basis of relaxing those restrictions if it's appropriate, as determined by comprehensive management planning at the farm level or something of that kind.

Mr. ENGLISH. Well, given that fact, and if the EPA then supports this concept, does it not make a good deal of sense at this particular point for us to move as rapidly as possible to evaluating every

farm in the United States on the basis of its soil and its environment in determining what applications of various materials can be used, and can that not be done on a scientific basis, particularly in light of the fact that the Soil Conservation Service has already the soil conditions of nearly every farm in this Nation?

Mr. COOK. Yes. That's obviously an incredibly ambitious undertaking. I think that our concern would be doing it only for interstate sludge application as opposed for all possible ingredients in the farm process that might somehow affect human health or the environment.

Mr. ENGLISH. Would the EPA support, then, moving in that direction for all materials, regardless of whether it's sludge or anything else?

Mr. COOK. I think you would find support here, but this is not something that I have discussed as a policy matter within the agency.

Mr. ENGLISH. Mr. Bridge, do you think the Department of Agriculture, then, would support an ambitious undertaking such as that in moving to make certain that, as far as the records of the Department are concerned, we're able to make those kinds of evaluations based on soil and weather conditions?

Mr. BRIDGE. Yes, I think we could respond to that, although I would point out—just let me say about the whole sludge business, I think if one could deliver at the farm boundary a known product in terms of what the composition of that sludge is, that's where the Soil Conservation Service and the Extension people can really do a job of integrating those sludge materials into the production systems of that farm and protect the environment, the food chain, and so on, and that's a good role for USDA to be involved in.

Your next question, we do have, based on much of our technology, tech guides, and so on, ratings of soils that are site-specific on farms across this country. I would merely suggest to you, though, that if we were going to approach that, we ought to do it on a highly targeted basis, where there are real problems out there and where the opportunities are the greatest for improvement.

Mr. ENGLISH. I think that makes sense, but again—and of course, one of the objectives of this particular piece of legislation is to approach it in one area. We don't have sludge being applied all across the United States to every farm. It is something that's growing. The interstate use of sludge is growing. So it's an area that's growing across the United States, so this seems to be an ideal way to, if you would, get a little bit of experience before we move on to a more ambitious undertaking of bringing in the rest of the farms. I would think that that would make a lot of sense. But it seems to me that you don't want to bite off more than you can chew and that this is a manageable way to introduce and move us into site-specific approaches to environmental questions and do it through sludge.

Mr. Cook, as I mentioned in my opening statement, there is not any intent to in any way displace, override, or anything else the rules and regulations of the EPA, but we need to move into a site-specific area, and this is one way it could possibly be done. Is it too late at this point, Mr. Cook, for us to get a little input as far as the final regulations on liability are concerned?

Mr. COOK. I think the best thing would be for me to provide something to your office. I understand your interest here, and we've discussed that some, and I just don't feel comfortable moving beyond what I've already said without talking to our lawyers on this.

Mr. ENGLISH. Well, if you could check and see if it's not too late for us to have some input, I think this subcommittee would definitely like to have some input on it.

Mr. COOK. OK.

Mr. ENGLISH. Mr. Smith, have you any questions?

Mr. SMITH. Just one more point to Mr. Cook.

Will or will not your proposed regulations include the facts that have been brought out at this hearing? Namely, it seems to me your responsibility is to provide a known product to the farm, and the application, the advice, and the consultation are then to transfer to SCS, those people within the States who are familiar with that portion of how we manage this product. Will your regulations include those kinds of words that will identify exactly where responsibility lies?

Mr. COOK. Our regulations will impose certain minimum management requirements on the farms that are using the sludge. They will also, in all likelihood, provide for adjustments on a case-by-case basis, and we can—I don't know that we had planned to, but we can certainly mention that the USDA folks on the scene for SCS and the Extension Service should be consulted in that process.

Mr. SMITH. Well, obviously, you're not going to shut them out. You use them anyway.

Mr. COOK. They're a very valuable resource.

Mr. SMITH. It will be comfortable if you mention them.

Thank you.

Mr. ENGLISH. Mr. Stenholm.

[No response.]

Mr. ENGLISH. I want to thank each of you, Mr. Bridge, Dr. Chaney, Mr. Cook, for coming before us and giving us your testimonies. I'm encouraged by the fact that there seems to be general agreement that it makes sense for us to move toward a site-specific approach to environmental questions as far as the American family farmer is concerned. I think that would be beneficial to the farmer and beneficial to the environment and the public in general. I appreciate your testimony. Thank you very much.

Our next witness is Mr. Anthony Haynes, and I'm going to ask if Mr. Chandler Keys, who is representing the National Cattlemen's Association, would also join Mr. Haynes. Mr. Haynes is with the National Association of Conservation Districts. If we could have both of you give us your testimony.

Mr. Haynes, we'll let you lead off, if you would, and again remind you, if you would, to summarize your testimony. Your complete written testimony will be made a part of the record.

STATEMENT OF ANTHONY C. HAYNES, DIRECTOR, GOVERNMENT AFFAIRS, NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS

Mr. HAYNES. Thank you, Mr. Chairman.

On behalf of the Nation's nearly 3,000 local conservation districts, we appreciate the opportunity to be here this morning and offer our views on H.R. 4360. Although we are not sludge experts from a scientific standpoint, as you well know, conservation districts have been the lead local entity in implementing and delivering conservation programs at the local level, along with and cooperating with our Federal and State agencies, for over 50 years. We have played many important roles in both the 1985 and 1990 farm bills in delivering these programs, as well as the Clean Water Act. We could sit here for a good while and name the acts and the programs, but we won't do that. And for the sake of time, I'm going to keep my remarks short so you can get along with your business, Mr. Chairman, and at the end of my remarks, I'll be glad to answer any questions you may have.

Conservation districts have been concerned for many years about this problem that we have of sewage sludge disposal, and we commend the interest of the committee. Mr. Chairman, particularly, we commend your interest in this subject and tackling this problem head-on and trying to come up with some sort of workable, practical solution in dealing with this matter. Sewage sludge contains both harmful and beneficial components, but NACD feels that with adequate and proper sampling, testing, application, and monitoring, we can turn this waste product and this nuisance into some sort of valuable resource.

H.R. 4360 designates USDA as having the responsibility for ensuring the safe and effective application of sewage sludge, but, Mr. Chairman, we feel that the lead role in regulating sludge application and setting the standards would be best left, and maintained by the Environmental Protection Agency—and this is an important point to us right here—in cooperation with our State and local governments. We feel that USDA's best role would be in providing the technical assistance for specific site-based planning, and we also feel that conservation districts could provide a valuable system as a local check and balance, as you've been highlighting to this morning for the local input. We feel the conservation districts could provide that local check and balance, by approving these application plans in much the same way that we do the conservation compliance plans, as mandated by the farm bills.

We would also urge that due to funding constraints the Federal Government is faced with and that also is shared by local units of government, we urge that the conservation districts receive the appropriate compensation for the compensation measures that are put forth in the bill. We support the intent of the bill, Mr. Chairman, on the respects of its financial accountability. As USDA is continually constrained with fiscal resources and budget constraints, this bill provides a financial mechanism that the producer of the sludge is financially accountable from day 1, where the sludge is in its raw form, to the day that we put it on the ground and start drawing up plans for it, and we commend you for that measure in the bill. Again, we would ask that conservation districts receive appropriate compensation when we apply and when we approve these conservation plans or these sludge application plans for the local fiscal resources that are expended.

Mr. Chairman, that concludes our main points, and as I said, for the sake of time, I'll cut it off right there, and if you have any questions, I'll be glad to try to answer those, and if I can't, return those back to you in writing and to the committee.

[The prepared statement of Mr. Haynes appears at the conclusion of the hearing.]

Mr. ENGLISH. Mr. Keys.

STATEMENT OF CHANDLER KEYS, DIRECTOR, CONGRESSIONAL RELATIONS, NATIONAL CATTLEMEN'S ASSOCIATION

Mr. KEYS. Mr. Chairman, thank you for inviting the National Cattlemen's Association to testify today regarding H.R. 4360. While the NCA does not have specific policy regarding the safe and effective use of municipal sludge, cattlemen do take an active role in promoting proper land stewardship. Since cattlemen operate on more land than any other segment of agriculture, NCA feels compelled to take steps necessary to protect land from possible degradation and promote sound production practices that ensure long-term productivity. We strongly believe the goal of land stewardship is best achieved through education and research that fuels voluntary actions.

With that philosophic statement in mind, NCA does have a stake in the issue of using municipal sludge as a fertilizer on agricultural land. No one disputes the need to find a safe and effective way to dispose of municipal sludge. Without an avenue of disposal, sludge would quickly overwhelm wastewater systems in our cities and towns. The question, then, is how to utilize the product without creating problems. Clearly, we cannot simply dump sludge on farm and ranch land in a wholesale manner without guidelines and protections for the landowner. The farmer or rancher has to be protected from environmental risk that could lead to degradation of land, water, crops, livestock, and human health. Every step should be made to greatly minimize any adverse ramifications.

We mentioned here the question of liability, and it must be taken into account. The real possibility exists that a landowner, after complying with all the current stipulations and regulations, could apply the sludge and somewhere down the road be faced with unknown circumstances and found to be liable for degrading not only his, but also neighboring assets. Long-term monitoring of sludge application sites may be necessary to protect against this possibility.

NCA would like to point out the tremendous differences between animal manure and municipal sludge. Animal manure is produced in a controlled environment where a likelihood of contamination of outside toxins is extremely remote. Municipal sludge, however, is produced in an uncontrolled environment where the risk of contamination by toxins is a known phenomenon. Records will show that nickel, tin, copper, lead, mercury, and other heavy metals are regularly found to contaminate sludge. Other chemical substances, such as asbestos, PCB's, and dioxins, have also been found. Because of this significant difference, NCA would strongly oppose any suggestions that land application of manure should be treated in the

same manner as municipal sludge applications, as outlined in H.R. 4360.

NCA strongly supports your efforts to give USDA the leading role in carrying out the mandate of your bill. The Soil Conservation Service and the Extension Service, along with other agencies at USDA, have a long history of voluntary cooperation with farmers and ranchers. This type of farm-by-farm analysis outlined in your bill to ascertain whether or not sludge could be used is the type of targeted approach farmers and ranchers prefer. This certainly should be a goal of other Government programs rather than the broad-based, blanket approaches that some of us in other committees would like to approve for agriculture.

This leads me to ad lib here a little bit. Right now EPA is beating agriculture over the head for nonpoint source problems in runoff, and in doing so, they name animal manure, chemicals, pesticides, but nowhere, to my knowledge, in any of their reports did they mention municipal sludge runoff from agricultural lands. That's another point just for the record.

The debate surrounding application of municipal sludge on agricultural land needs to continue. The agricultural community must insist on sound research, followed by intense education on safe and effective ways to use municipal sludge on rural lands.

With that, that's the end of my statement.

Thank you.

[The prepared statement of Mr. Keys appears at the conclusion of the hearing.]

Mr. ENGLISH. Thank you very much, Mr. Keys. I appreciate that.

Mr. Haynes, what do you think about the site-specific approach to application of whether it's sludge, pesticides, or fertilizers or whatever it may be? Do you think that makes sense?

Mr. HAYNES. Yes, sir, we do, as long as that is incorporated in some sort of plan, whether it be a conservation plan or whether it be a sludge application plan, and as long as it is approved at the local level, usually by the local conservation districts. As you well know, we are very strong on the issue of local input on what we're doing with whether it be agricultural programs, pollution control programs, because local conditions and local situations are unique, and we can't put one blanket approach in Washington on what agricultural or sludge programs should be nationwide. We see our role being important to that in ensuring that those local conditions and situations are not only addressed, but they are met, and I guess, that's how I see the site-based—does that answer your question, Mr. Chairman?

Mr. ENGLISH. Well, partially. I guess what I'm getting at more than anything, it would seem that really what we're talking about is more of a scientific question if we go site-specific. You've got certain kinds of soils, you've got a certain kind of environment out there; therefore, you can have different applications of various materials without there being any threat to neighboring farms or the surrounding community. I would agree with you, going beyond that, that indeed we would want the local people involved.

I guess what we're really looking at here—and as I said, using the question of sludge, since it's not applied to that many acres across the country at this particular point—is, how do we open the

door to move into that area? How do we actually build up this kind of information on farms throughout this Nation, and how do we use that, then, to protect the American family farmer from liability? If in fact, from a scientific standpoint, he can show what he has in fact applied, he's got protection. And as Mr. Keys pointed out, as it is now, it's just fair game on the farmer. It's open season on him.

And that's really what I would envision that this would move toward and hope that it would move toward, and also then bring that back in line with the conservation plans we have or any other environmental laws that we have that may apply to farmers. There needs to be some way we can bring this thing down so that farmer's got it for his farm and he knows he's safe and he's protected, and he can go into court and say, "Here's my records on it, here's what I've got, and here's what's been laid out that I can apply to my farm, and I'm safe," and we get away from a lot of this. Because I've got to say, I strongly suspect that the American family farmer right now is getting blamed for a lot of stuff that's really not his doing, and that's something that I think has to be addressed.

I'm hopeful that this is—if you would, a crack in the door. We're opening the door slightly, seeing if we can move the Department of Agriculture into this arena in a small way, and then hopefully using that experience to gradually enlarge this to the point that we all are tying down to basically scientific information pertaining to each farm, much in the same way as we handle our conservation programs now. Does that make sense to you?

Mr. HAYNES. Yes, sir.

Mr. ENGLISH. Mr. Keys, have you any other thoughts with regard to the concept or the approach?

Mr. KEYS. I think the concept is great. The site-specific, targeted approach is preferable from the cattleman's viewpoint, as long as it's on a voluntary basis, and I think a lot of people would sign up for that type of program if they thought it would protect them down the road from anybody accusing them from some type of activity. They could say, "Well, USDA set up this plan for me, I complied, I put it in place on a voluntary basis, and they approved it, and now you're telling me another agency may come in and say I'm liable for some activity that I was already approved for by another Federal agency." I think that protection would be well-received by farmers and ranchers.

Mr. ENGLISH. I think you make a good point, and that really comes down to the same old adage of you can lead a horse to water, but you can't make him drink. This obviously would be made available as our conservation programs are made available to farmers. If farmers decide they don't want to participate in the farm program, it's their land, they go out and do what they want to, and they take the consequences. If they're right, fine; if they're wrong, they pay the price. And that's pretty much the case today. I would think that that's exactly what we're talking about under these circumstances.

Mr. KEYS. I might make one point. Farmers and ranchers need to get credit for what they've already done, too, and it needs to be integrated into any future program. The problem that we heard with

EPA today is that they put a very high standard, and then the gentleman just mentioned that they may ratchet it down if they go out and find different scenarios. Well, that's a top-down approach that the American farmer and rancher just doesn't appreciate, because it doesn't take into account his local area, what he's been doing on a local basis, even all the way down to site-specific, and I think he needs to have credit for what he's done in the past.

Mr. ENGLISH. I would agree, and I would envision that by taking a site-specific approach, we would get away from that kind of approach to environmental questions.

Mr. Smith.

Mr. SMITH. No questions.

Mr. ENGLISH. Thank you both. I appreciate your testimony. I do indeed.

The next two people we have for the panel are Dr. Cecil Lue-Hing, who is director of research and development at Metropolitan Water Reclamation District of Greater Chicago, and he's testifying on behalf of the Association of Metropolitan Sewerage Agencies here in Washington; and Mr. Richard D. Kuchenrither, director of residuals management at Black and Veatch in Kansas City, and he's testifying on behalf of the Water Environment Federation here in Alexandria.

Dr. Lue-Hing, we'll let you lead off, if you would.

STATEMENT OF CECIL LUE-HING, DIRECTOR, RESEARCH AND DEVELOPMENT, METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO, ON BEHALF OF THE ASSOCIATION OF METROPOLITAN SEWERAGE AGENCIES

Mr. LUE-HING. Thank you, Mr. Chairman.

You have already given some idea of who I am, and I'll cut the time down by saying the association which I represent serves about 57 percent of the sewered population in the United States, and we do treat a lot of wastewater—13 billion gallons each day. I'm pleased to be here to bring you some of our views on H.R. 4360.

In terms of sludge management, I would like to first bring to the attention of the subcommittee the interagency policy on the beneficial use of sludge on Federal land. This policy was developed jointly between Agriculture, Defense, Energy, and Interior, with the USEPA, Food and Drug, and the Tennessee Valley Authority all cooperating in this policy. The policy advocates those municipal sludge management practices that promote beneficial use of sludge while maintaining environmental quality and protecting public health.

I would also like to bring to your attention the pending USEPA, part 503, sludge regulation. These we expect to be out in July 1992. While we concur with your concern relative to those expressed in H.R. 4360, to the importance of ensuring the safe and effective application of sludge to agricultural lands, we disagree that the need exists for such legislation in light of these comprehensive regulations which we expect from the EPA this summer. The EPA has done extensive work researching the issues, many of which you have mentioned in your bill, and we believe also that these research efforts were participated in by the USDA, and these re-

search efforts have all been incorporated in the bill which is pending this summer.

The rule also dictates sludge management practices, the EPA rule. Unlike H.R. 4360, the USEPA's regulation will govern all application of sludge to land, be it agricultural or nonagricultural, and will apply regardless of whether the land application occurs in the same State in which the sludge was generated.

EPA's rules are risk-based, and in the final analysis, they are very conservatively structured to protect human health, soil fertility, ground water, surface water, animals, and soil biota. The rules were based on a very large mass of information which has been collected over the last two decades, at least, much of the information was supplied by other agencies of Government, including the Department of Agriculture.

Under the State management program, in addition to the high level of protection provided by the USEPA regs, the USEPA has recognized that exceptional circumstances may exist that occasionally warrant stricter controls for implementation on a case-by-case or site-specific basis by State or permitting local authorities. This coupled with required frequencies at which treatment works must monitor—meaning analyze chemically and biologically—their sludge, specific records that must be kept, and required information that must be reported to the permitting authority to ensure compliance, clearly indicates that the ultimate level of environmental control resides with the States. States may utilize this latitude to protect more sensitive ecosystems in their jurisdictions, and can impose more stringent standards and management practices in programs that utilize sludges not ideally suited for application to agricultural land.

Mr. Chairman, there is also a document by EPA which indicates that each State currently has some mechanism for controlling sludge. This virtually guarantees that public health and the environment will be protected from adverse effects. States have this authority and they have this capability in spite of the EPA's 503 regs, and tailored, site-specific requirements can be generated at the State level.

Prohibition on application of other States' sludges to agricultural land. The current bill would potentially prohibit the application of sludges generated in one State to agricultural land in any other State, but would not apply to any sludges being applied to agricultural lands in the State in which the sludge was generated. This targeting of out-of-State sludge for additional regulatory control is not necessary, because the controls proposed would not improve upon the comprehensive umbrella of protection provided by EPA's rule. We believe H.R. 4360 may in fact have adverse impacts on public health and the environment by promoting a confusing and potentially contradictory regulatory framework which may also unnecessarily increase the cost of out-of-State land application programs. This bill would serve to discourage beneficial use of sludge through land application and may promote other less environmentally protective sludge management practices.

The USEPA's bill specifically developed regulations to apply to all applications of sludge to agricultural lands nationwide and made provisions for site-specific consideration. It makes no differ-

ence to public health or the environment where the sludge is of prescribed quality that are applied to agricultural land are from in-State or out-of-State. When one considers that agricultural commodities and surface and ground water readily flow across State lines, specifically targeting out-of-State sludge application to agricultural land is unnecessary and serves no sound public policy or regulatory purpose. Furthermore, this approach to sludge management has no basis in environmental or agricultural science.

We believe there is a need for public education which can be participated in. As scientific research improves our understanding of the behavior of sludge-borne contaminants in the food chain and the environment and allows us to estimate risks more accurately, it is extremely important that this understanding be communicated to the general public. Therefore, AMSA urges the subcommittee to consider the importance of public education in the future success of programs, such as application of sewage sludge to agricultural land, which beneficially recycles materials that would otherwise be disposed of as waste.

The USDA is an ideal Federal entity to establish national public education programs, because they have already an effective network in place—namely, through the Agricultural Extension Service. AMSA encourages Congress to make additional resources available to USDA for establishing a national public education program on the beneficial use of municipal sludge. AMSA believes that the Congress should also make additional resources available to support similar education programs conducted by the USDA.

We have some recommendations, a couple of them, Mr. Chairman. We believe that the part 503 regulations would provide extensive oversight for the management and permitting of municipal sludges. The proposed legislation, H.R. 4360, we believe to be duplicative of this comprehensive regulatory framework and ignores the fact that USEPA and USDA have for many years jointly considered the impacts of land application of sewage sludge. Promulgating a new set of USDA regulations at this time would not contribute to public health, safety, or environmental goals, but would make it more difficult to meet the national goal of beneficial use of sludge.

For these reasons, we oppose H.R. 4360, and we recommend as follows. One, that Congress provide additional funding to the USDA and EPA in order to support continuing research in this area. This would be a most effective way of ensuring that the Nation's sewage sludge will be utilized in a manner that is both beneficial to agriculture and protective of environmental resources. Two, that the Congress provide the USEPA and the USDA with additional funding to support the development of public education programs to foster better public understanding of the application of sewage sludge to agricultural land and to promote greater public acceptance of the beneficial use of sewage sludge.

This brings my oral testimony to a close, Mr. Chairman.

[The prepared statement of Mr. Lue-Hing appears at the conclusion of the hearing.]

Mr. ENGLISH. Mr. Kuchenrither.

STATEMENT OF RICHARD D. KUCHENRITHER, DIRECTOR, RESIDUALS MANAGEMENT, BLACK & VEATCH CONSULTING ENGINEERS, ON BEHALF OF THE WATER ENVIRONMENT FEDERATION

Mr. KUCHENRITHER. Mr. Chairman, I have a written statement which I would ask be included in the record, and with your permission, I'd just like to touch on a few key points.

Mr. ENGLISH. Without objection, your prepared statement will appear in the record.

Mr. KUCHENRITHER. In addition to being director of residuals management for Black & Veatch, I also am a past chairman of the residuals management committee for the Water Environment Federation, and I'm here today on behalf of the federation. We're a nonprofit technical, educational, and professional organization devoted to providing leadership and guidance in the preservation of our Nation's water quality.

At Black & Veatch, I've been responsible for planning and helping to implement sludge management programs for hundreds of cities across the United States, including Boston, New York, Philadelphia, Minneapolis-St. Paul, Los Angeles, and Denver. This experience, I believe, has provided me with a unique perspective on not only the benefits associated with utilization of wastewater sludges, but also the problems associated with developing programs aimed at deriving those benefits.

I believe, first of all, it's important for the subcommittee to recognize, as I'm sure you do, that agricultural land application has been, and continues to be, successfully used by numerous communities across the United States. The economic, agronomic, and environmental benefits which farmers have realized through the use of sludge in lieu of commercial fertilizers to their lands have been extensive.

The second point that I think is important for you to recognize is that the Soil Conservation Service and the agricultural Extension agents have played really key roles in helping to develop a lot of the successful long-term land application programs in existence today. The SCS and Extension agents with whom I've worked enthusiastically endorse the proper use of sludge as a fertilizer, and in fact, their endorsements have helped overcome some of the reluctance of many of the farmers that participate in the programs.

Mr. Chairman, even though the goal of H.R. 4360 is to promote safe beneficial use, I believe that it would actually make it more difficult for many farmers to derive the benefits from utilization of sludge. It would do this, I believe, by unnecessarily increasing public concern and decreasing public acceptance of these programs. The most important part of any sludge utilization program is agreement by the local community that this practice is beneficial and represents no risk. A strong regulatory program is of utmost importance to public acceptance.

To this end, EPA has almost completed the comprehensive risk-based sludge management regulations. These will obviously strictly govern the use of sludge on agricultural land. I feel also that it is important for you to know that while EPA's new regulations are being finalized, sludge is not an unregulated commodity. Currently,

every State regulates sludge in some fashion, and we acknowledge that although specific regulations vary from State to State and are not uniform, they have been effective in ensuring the safe and beneficial use of sludge on agricultural land for many years.

Another important consideration is that over the past 10 years, sludge quality in the United States has improved dramatically. This is due, I believe, to our successful industrial pretreatment programs that have decreased the amounts of metals and toxic organic compounds in our wastewater plant sludges. The dramatic improvement in sludge quality really has been the primary reason for increased public acceptance of agricultural land application and other beneficial uses of sludge.

H.R. 4360, I believe, could potentially have a negative impact on public acceptance of sludge use by unnecessarily raising concerns among the public that they are not adequately protected by existing regulations, given the soon-to-be-released comprehensive Federal regulations and the existing State regulatory framework. There are really no valid environmental or public health reasons for imposing further restrictions. While this legislation is intended only to impact sludge transported across State lines, it could also have a significant impact on those agencies that distribute their sludge solely in-State, including the champagne sludge that's produced in Oklahoma.

The distinction between in-State and out-of-State sludge will most certainly be lost on the public, as I think it was on members of this subcommittee in listening to some of their earlier questions today. I believe that this is only going to work to reinforce the misconception that all sludges are bad. This may also lead to the mistaken impression that sludge which originates in-State is, by definition, of a higher quality, when indeed it may not be.

In conclusion, Mr. Chairman, the beneficial use of sludge as an agricultural fertilizer and soil conditioner is a vitally important activity from which farmers reap both environmental and economic benefits. I believe it will play a key role in the development of low-input, sustainable agriculture that indeed may make us more competitive in the future. We believe that the regulatory regime outlined in H.R. 4360 is unnecessary in light of the current and pending regulatory actions whose purpose it is to ensure the environmental soundness of our agricultural land application of sludge.

The Water Environment Federation would like to work with this subcommittee and the USDA to extend our public education efforts through the existing agricultural network, and we believe this will contribute to a broader understanding of the benefits for farmers associated with the use of wastewater sludge on agricultural land.

Thank you for allowing me to appear before you today, and I'd be happy to answer any questions you might have.

[The prepared statement of Mr. Kuchenrither appears at the conclusion of the hearing.]

Mr. ENGLISH. There seems to be, though, a real difference as far as the perception of in-State and out-of-State, not because of what is contained in the sludge as much as it is, I think, the concern about what may be in it and what control an individual State may have in determining what it contains as opposed to what's contained in State sludge.

I've got to say in my own State of Oklahoma, for instance, we haven't heard a great deal about the sludge that's produced in the State of Oklahoma being applied to agricultural land. However, we had a company that wanted to come to Oklahoma and wanted to apply some sludge from New York City. There's an awful lot of concern about New York City sludge. There is a great distinction made between what is produced in New York City and what is produced there, and it hasn't come from just a few folks out there that are concerned about it; it's come from the university community as well.

I'm making the point that there may very well be differences in what is contained in the way of—in fact, we received a study from some of the folks out there in that part of the country dealing with arsenic, chromium, copper, lead, mercury, nickel, zinc, and so on, as it applies to what is produced locally as opposed to what is contained in the sludge from New York City. That is the concern and alarm that I think people in that area have felt, and it hasn't just applied to the people locally. It's also applied within the State.

For instance, I've got a position that was taken adopted by the Oklahoma Grain & Feed Association, and their concern is—they're increasingly concerned about the issue of New York City sludge. All the way through, it's New York City sludge specifically identified. So it's not just sludge we're talking about here. It's the concern, I think, that a lot of people have that, as was pointed out here, and I'll end it up here with the Oklahoma grain industry will be concerned with the perception problem of purchasing food of the types of crops as opposed in this case to a New York City sludge.

So that's what you're dealing with. That's the reality of it, and we can argue it square, we can argue it round, but that's the reality of where we are. I guess looking at it strictly from a sludge standpoint—and I've already addressed, I think, going to the site-specific point, which I think makes a good deal of sense, but also from a sludge standpoint in meeting with those people who are both for and against New York City sludge. Both sides of the fence. The one thing that they all seem to be able to generally agree on is that if they had some way of determining for certain what is contained in that material that's going on that land, that gives reassurance to the community.

So this legislation is addressed in that direction as well, and as I said, there is the reality, granted, that it may be very well from Chicago, it may be a lot cleaner than sludge coming from Oklahoma as far as various materials. I don't know, but unless it is in fact tested and that kind of assurance can be made and it can be shown that in fact that is in keeping with what that State law is—and they know good and well that the State of Oklahoma doesn't have the resources to go out there and test that stuff. They know they don't. So they're simply taking other folks word for it, and that was the reason from an agricultural standpoint, from moving this toward site-specific approaches to the environment to dealing with concern and alarm that a lot of people have whether they're the farmer in question or, more likely, the community around that area. It's a good way to resolve it, to answer it, to deal with it.

It seemed to me that this hit a lot of areas, and quite frankly, I assumed that you all would be supportive of this kind of approach,

because it does, as I say, lay to rest those kinds of questions. This particular company, quite frankly, that wanted to dispose of some sludge in Oklahoma, this wasn't their first stop. They went to, I believe, four other communities in the State and they'd find a farmer or two who would agree to put that sludge on their land, and the local community came unglued. It got vicious, this wasn't just simple disagreement. It got vicious. Threats were being made against people. People who were friends, friendships were being split apart. It was a very divisive issue in the community, and we had the company that was moving from town to town trying to find a community that would sit still for it.

Now, that's the difference between what is produced in-State and what is being produced and shipped halfway across the country. You can say, "Well, that's a perception problem and they don't have any reason to worry." That may be, but perception is reality in this case, and that's what we're dealing with out there, and it would seem to me that if in fact you're promoting this idea, that there wouldn't be any objection to that. And there are some folks making a lot of money off this stuff. As I understand it, New York City is paying $500 a ton. That compares with what I understood was the next highest, which was Washington, DC, at about $200 to $250 a ton. Big money.

So isn't it worth a little bit of something to, one, be able to assure the local people as to what is being used on the land; two, to make certain that farmers have some protection and their markets are defensible as to what material has been spread on farmland; and three, to make certain that we are proceeding in dealing with this particular sludge that is being applied to the land in a way that would be the most beneficial and have the greatest benefit to the farmer? I don't know, that seems to me to be some reasonable goals for us to go at. Again, there's nothing in here that offsets anything EPA is doing or anything that the State is doing.

I guess I've got to ask the question: Where's the gripe? What's the problem?

Mr. LUE-HING. Mr. Chairman, if I could take a shot at that question, I don't think we are debating with you your concern for quality or your concern for perception or the concern of your local communities. We are not at all debating that. We support your interest in wanting to assure your local citizenry that the material they receive is of the quality you would like to see delivered to them.

Mr. ENGLISH. Meets the State law. That's all.

Mr. LUE-HING. Right. Now, one of the comments you made earlier relative to inspection is part of the issue that we are here to discuss with you—the pathway to get to your desire, your goal. For example, the presence of a State, Federal, or local inspector while the sludge is being placed on the land would tell you nothing about arsenic, copper, cadmium, or zinc, as you related earlier.

Mr. ENGLISH. Excuse me. Could I interrupt you right there?

Mr. LUE-HING. Sure, sir.

Mr. ENGLISH. You're telling me if a test were run of that sludge when it arrived at the location that in fact they couldn't determine that those elements were present?

Mr. LUE-HING. The type of tests that we need to determine arsenic, for example, could not be run while the inspector is standing there.

Mr. ENGLISH. Well, that's not what we're talking about. We're talking about a test to be run before that application is made. Now, I've been told by those who have expertise that you may be talking about a delay of 24 to 48 hours. Most likely it would be less than 24 hours for those tests to be run. Is that correct?

Mr. LUE-HING. Yes, and these tests are run. The difference in our interests here—not interests, but difference in our mechanics here is these tests are run at the time the sludge is generated.

Mr. ENGLISH. By whom?

Mr. LUE-HING. By the generator.

Mr. ENGLISH. See, that's the problem. The guy who's got the most to lose if he finds something in there is the guy that's running the tests. That doesn't give assurance to the folks out there.

I hate to say this, but people have been known to lie, cheat, and steal in this business, as they have all other businesses.

Mr. LUE-HING. I realize that.

Mr. ENGLISH. And that troubles us.

Mr. LUE-HING. However, you are, then, laying a very difficult and unsavory burden at the feet of local governments.

Mr. ENGLISH. I said like it does all businesses. Believe it or not, there are even a few politicians that get into that.

Mr. LUE-HING. For example, I can speak strongly for Illinois, and I can speak strongly that any information you require of any batch of sludge we generate, I can mail it to you tomorrow. This is available, and generators of sludge are in fact responsible units of local or regional government, and information we generate, Mr. Chairman, is public information. It's open to the public, and we don't really get into a darkroom, generate some numbers, and toss them out.

I'm asking that you bear with us and understand that we do have in place local units of government, very sophisticated mechanisms, instrumentations, systems, and personnel to do that, and to require this to be done on the site when it takes 24 hours more or 48 hours more—somebody has to pay for that, and it's usually the people that you represent, and I'm suggesting that that's not necessary. There has to be some modicum of trust between governments, and I'm saying to you there is no perfect system, even one that you may devise, Mr. Chairman, and I'm saying please understand that we want to work with you and we want to offer the same protection that you desire, but the pathways that we are talking about are slightly different.

Mr. ENGLISH. Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman.

Dr. Lue, you're the research director for sewage agencies that represent, by your testimony, 57 percent of the sewered population in the United States.

Mr. LUE-HING. Yes, sir.

Mr. SMITH. And your recommendations are asking the Federal Government to produce more money for research and for public education, which benefits directly your organization. Since this is a very valuable resource, can be, surely you've got to get rid of it,

why don't you shoulder the research and public education? It's to your direct benefit. Why do you want the Federal Government to do it? I mean, the Federal Government is broke. This would be a direct benefit to your organization, a direct benefit to all your facilities, could be a very valuable resource. And you of all people, the research director, why aren't you promoting this program?

Mr. LUE-HING. Mr. Smith, the recommendation in my statement I think is well-founded. If I speak solely for my agency in Chicago, the last 20 years we've spent on the average almost $2 million a year on sludge research alone. Much of this information which we have generated in the last 20 or 21 years was made available to the USEPA and Department of Agriculture in their deliberation on the development of the sludge regulation. As a researcher, I wear one hat. As an operator, I wear another hat. But since I'm operator and researcher every day, I wear both hats, and the research part of me tells me that we can always use additional information.

Mr. SMITH. Of course.

Mr. LUE-HING. I'm saying that while we believe we have a lot of good information, we would suggest that the Federal Government support additional work, which you may find more plausible to do if it is federally funded or if there is a Federal interest in its funding.

The perception issue is one that we, too, are sensitive to, and if all the information you have is generated in Chicago, you may have some problems with that. We are suggesting that while we spend a lot of money in Chicago, you can assist the program nationally by putting a couple of cents of your Federal resources in a national program for education and additional research.

Mr. ENGLISH. Doctor, I was just looking, there's an article in one of the agricultural publications, Top Producer, in March of this year that talked about an individual who uses a lot of sludge on his land. While he's a big promotor of sludge and the use of sludge and so on and so forth, he keeps very close records of the substances that are applied to his land, and particularly he keeps running totals on the heavy metal input onto that land. And he points out that the city of Los Angeles only samples its sludge once a month, and he points out that the city of Yuma only samples their sludge once a year. And as a result, he ends up sending samples in to the lab of the material that they send him at the cost of $1,200 a pop for each test that he runs.

Now, someone who is obviously a promoter and is using sludge recognizes that, from a liability standpoint, he better know what he's doing, and he better keep close tabs. Is once a year adequate to determine what this material contains that's being placed on farmers' land?

Mr. LUE-HING. Probably not.

Mr. ENGLISH. Is once a month adequate?

Mr. LUE-HING. It could very well be. Again, in the system that we are discussing, EPA-Federal-State-local relationships, the State, in the case of Yuma, Arizona, for example, could determine or could say to Yuma, "You should be testing your sludges once a quarter or once a month or once a week." The issue is best resolved locally.

Mr. ENGLISH. Well, that's my whole point. People seem to be satisfied when it's resolved locally. The trouble comes when you start shipping this stuff halfway across the country. That's when people get excited, and that's when they don't have confidence. They don't have confidence in what testing the city of New York may have done if it's being shipped to Oklahoma. They may have confidence in what testing was done on material that's produced in Oklahoma. Maybe that's right and maybe it's wrong. I don't know. Maybe they're mistaken to do that.

But the point that we're making here is, in order to provide this kind of assurance, if this material is going to be shipped from State to State, in which people have little or no understanding or regard as to what the laws may be within that State, how much testing is done and when it's done? And all we're being told is: "Well, the people that are producing it are doing the testing," that does not generate confidence. I would suggest to you again that perhaps if farmers become more aware, as this farmer has here, they may indeed want to see this tested a good deal more than what is simply being done by some municipality someplace.

Mr. KUCHENRITHER. Mr. Chairman, if I might add to that, having, for better or for worse, inspected years and years of sludge quality data from cities all over the country, typically sludge qualities are fairly uniform. Now, I'm not saying that's a justification for only going to once-a-year sampling. It may be, but just as a matter of course, they are particularly uniform. You don't see great fluctuations from time to time.

Mr. ENGLISH. Fluctuations from what?

Mr. KUCHENRITHER. In quality of sludge—concentrations of organics.

Mr. ENGLISH. Over what period of time?

What about material that gets dumped in there on a one-time basis?

Mr. KUCHENRITHER. In the sludge quality data that we see, we don't see that that impacts sludge quality very significantly.

Mr. ENGLISH. A substantial increase in nickel is not going to make much difference?

Mr. KUCHENRITHER. It depends on how you define substantial.

Mr. ENGLISH. Well, let's say what New York City has. If you double the amount of a particular load that's going into—one load from New York City and that's applied on the farm, is that going to make any difference?

Mr. KUCHENRITHER. Well, if you double the amount of copper from 200 milligrams per kilogram to 400, the answer would be no.

Mr. ENGLISH. What about 8,700 milligrams on nickel?

Mr. KUCHENRITHER. Say again?

Mr. ENGLISH. What about 8,700 milligrams on nickel?

Mr. KUCHENRITHER. It would depend on the specific use.

Mr. ENGLISH. Well, you're putting it on the farmland out there. We're going to go out there and scatter it on the land in western Oklahoma. Is that going to make any difference?

Mr. KUCHENRITHER. I think certainly high nickel concentrations would be of a concern, and it's something that we have to be aware of, and I think the point that I would make is that we seem to be——

Mr. ENGLISH. Well, let's back up, though. Let's not go too fast over this, because what we're talking about is one particular train load that goes to western Oklahoma. You've got twice the amount of nickel it's supposed to have, it gets dumped on lands being used by dairy cows. Is that going to make any difference?

Mr. KUCHENRITHER. Congressman, specifically for that case with nickel and dairy cows, I can't answer that. Dr. Chaney is here, and perhaps he could.

Mr. ENGLISH. Dr. Chaney, is doubling the amount of nickel a threat on dairy cows?

Mr. CHANEY. Your principle is good. That example doesn't wash. The cattle are safe from all the wheat that can grow. But the principle——

Mr. ENGLISH. What about water with dairy cows?

Mr. CHANEY. Water for dairy cows is regulated at the State level, and there are standards to protect livestock.

Mr. ENGLISH. I'm sure you're familiar with the article that was in the Farm Journal last month about the dairy farmer up in the State of Washington and the problems that he was having with regard to his dairy cows and the examination that—and I'm sorry, I didn't really want to get into this this much—what has happened to his dairy herd, the impact it's had on his dairy herd, and are you disagreeing that that's the cause of this particular problem?

Mr. CHANEY. The Federal Government has not evaluated the case enough and provided data specifically about that case. I know that individuals in the Environmental Protection Agency are seeking the facts. As far as we have been able to find out, there's no scientific basis for the claims in that article whatsoever. We know a lot about sludge, and the facts don't add up particularly with regard to ground water and the fact that he didn't use the sludge himself, his neighbor did.

Mr. ENGLISH. And it got into the water supply, supposedly. The nickel did.

Mr. CHANEY. The State hydrology or the State departments have shown that the ground water flowed in the other direction, away from his farm, not toward his farm. And regarding the particulars, several of the concentrations that were at least published in that article are specious.

Mr. ENGLISH. Are what?

Mr. CHANEY. Specious. Very questionable. Very, very questionable. Levels like that wouldn't occur below a nickel mine, let alone below a field treated with sewage sludge. There are scientific limitations, and that says to me that either the sampling was wrong or something like that.

Mr. ENGLISH. Well, something's impacting those dairy cows out there. Wouldn't you agree?

Mr. CHANEY. But saying that it came from the neighbor's use of sludge is a different question than that he might be having a problem. That's one of the difficulties about sludge. That is, people say, "Gee, it must be sludge," because sludge has a bad name, whereas in fact, there may be no connection whatsoever.

Mr. ENGLISH. Is USDA involved in investigating this case?

Mr. CHANEY. This particular case, to the best of my knowledge, USDA has not been directly involved. This has only been brought

to our attention through this newspaper, and I do not have the facts at hand.

Mr. ENGLISH. So in those cases, they don't call upon you or the Department of Agriculture to investigate?

Mr. CHANEY. This is why I'm particularly curious about these cases. Cases all across the country where there have been reported problems that have been through the Extension Service, through the State testing laboratories, and they—to say it politely, nearly every significant sludge question comes up to Beltsville sooner or later. I had never heard of this, and it's partially because they haven't gone through the farm network and verified these data.

Mr. ENGLISH. Well, maybe we ought to hook into some way that goes directly to you all any time we have a case like that reported to the State.

Mr. CHANEY. It usually goes through the State starting at the Extension Service or the State veterinarian program and so on. I will agree that nearly every case where there's a real problem with the herd or fields does come through the agricultural system, and if it's shown to be significant in that regard, it will either be dealt with there or questions raised and brought up further in the chain.

Mr. ENGLISH. Very good.

Mr. KUCHENRITHER. Mr. Chairman, also in addition to that specific case, in the same letter that Dr. Chaney was referring to, they also state that there are several other farms that share the same well with a common water supply, and they've experienced none of the same problems.

Mr. ENGLISH. Like I said, there's a good way to take care of that. If we knew exactly what went on the land, then we'd know how much nickel was in that load, wouldn't we? [Laughter.]

Mr. KUCHENRITHER. Could I get back to the nickel in the load question that we left just a second ago? That is, your concern about the adequacy of the testing. First of all, I don't think there's anyone—the federation that I represent has environmentalists, it has folks who spread sludge on the ground for a living, it has operators and owners of wastewater treatment agencies, so it's a broad spectrum, and I don't think that there's a person in our federation that wouldn't be concerned about what is the quality of the sludge that's going to be applied on their neighbor's ground. I know certainly I would be, and I deal with the material all the time. I think there are lots of ways to overcome this problem of independent testing and also helping to pay for these programs. As you say, there's a lot of money involved in this, and proper monitoring and analytical testing is a very minute fraction of that $500 to $1,000 a dry ton figure you quoted.

Mr. ENGLISH. Well, that's exactly my point. It isn't going to cost that much, you're going to put these people at rest, we're going to go site-specific. It makes a lot of sense to head down this road.

Mr. KUCHENRITHER. Yes, sir. I agree wholeheartedly, and I think that most of us would concur with that, that that is one way to fund these types of activities.

Mr. ENGLISH. I would hope that you all would take another look at this particular approach, particularly if you're talking about moving this interstate. Any way you want to look at it, I think you're going to find that you have a much higher degree of accept-

ance from the local communities in this approach as opposed to simply the EPA's deal saying, "Well, one of these days we'll monitor them, and we'll let the folks produce it and do the"—see what I mean?

Mr. KUCHENRITHER. As we said in the statement, an important function of public acceptance is an absolutely sound regulatory program. There is no doubt about it. I've been to public hearings. I participate in public hearings. I understand exactly what you're talking about, and as engineers, we rely on this regulatory framework.

The thing that concerns us in the federation is this loss of distinction between foreign and nonforeign sludge or imported and local sludge. There are several dozen active, operating land application programs in Oklahoma, and what we've found in the past is that when concerns boil up about sludge and sludge quality, you lose all distinction between foreign and domestic sludge or in-State or out-of-State sludges. We've seen this happen in the past. And so this is why we need to be very careful as you proceed with this legislation to make sure that we don't mess up a lot of well-run, very beneficial programs that benefit a lot of farmers in this country.

Mr. ENGLISH. Well, perhaps we should just include everybody, in-State and out-of-State both.

Mr. CHANEY. Clearly that would be the intent of the part 503 process, and I agree with your concern, but the frequency of testing and the degree of independent sampling and testing that is proposed at this time may not satisfy the goal that you see as appropriate that the Government do, and I think you have every reason to check into and verify what is planned.

I wanted to make one other comment——

Mr. ENGLISH. Of course, also, I've got my other motive here, and I want to continue to lay that out on the table. We're moving toward—and quite frankly, I'm very candid about this, it's part of the way we will move into a site-specific approach to all of these issues, which I think makes an awful lot of sense. So that, if you want to look at it, well, it may not be fair for us to pay for the testing and pay for moving agriculture site-specific, well, you've got that complaint and you can make it, but this is the way that—under today's budgets and today's world, quite frankly, this is the way it's going to have to be done.

And this does a couple or three things. I think it does provide benefits to those who want to see sludge used and have confidence in sludge, because it does provide that kind of assurance, and I think it reassures the public, and I think you need that very badly. And at the same time, I think it's certainly going to be achieving a worthy goal, and the other part of it is, I think it's going to mean that you'll be able to use these materials where they will have the most positive benefit, matching up more of the type of soils with the kind of sludge. I don't know, it just seems to me like there's an awful lot of benefit all the way around.

I can understand EPA's reluctance to get into it, because quite frankly, in the bureaucracy we get in a little of these turf battles, and people don't want you getting over in their turf. I can appreciate that, but in this case, I think we have agricultural concerns, and I think in this case, agriculture is performing a service, and I

think agriculture deserves a little bit of reassurance and, if you want to, deserves to be humored just a little on this issue, just to kind of make us feel good, if you would, so that we're not feeling like we're being taken advantage of and that we're not simply becoming the dump for the rest of the country. I think there's a little of that psychology, too, that works into it. I hope you all kind of think about that a little bit.

Has anybody else got anything they care to say?

Mr. KUCHENRITHER. One last point.

Mr. ENGLISH. Sure.

Mr. KUCHENRITHER. It's been my experience that farmers are very shrewd and intelligent people, because I know I've dealt with a lot of them over the years in my business in sludge, and I would really encourage both you and your staff to talk to some of the farmers who utilize sludge presently——

Mr. ENGLISH. Well, let me tell you something. The objections have not been coming from the farmers that are using sludge. The objections have been coming from those that are not using sludge and particularly people living in the communities around that area. That's where the fuss has kicked up. So, generally those are the people that I think have to be reassured. I understand the farmer is the one usually getting the economic benefit. He's receiving the money for it, and any benefit he sees on his farm, he's getting that. But it's those folks over here that aren't getting paid anything and they don't see any benefit from it, and all they know is, "I don't know what this stuff is that's getting shipped in here. It's waste, and it's getting dumped on this land, and I don't want my kids glowing in the dark." That's basically what it comes down to.

Mr. KUCHENRITHER. Yes, sir. Therein lies our educational challenge right there.

Mr. ENGLISH. Yes. Well, as I said, I guess you could look at this as part of our educational effort here if we test these loads as they come in. [Laughter.]

Mr. CHANEY. Let me say that, as it happens, each of the three of us serve on a technical advisory committee in New York City and essentially advise exactly what you're suggesting to them before they let out the request for proposal for the contractor that caused all this difficulty. It's the old "lead a horse to water" and all that. You couldn't make New York City take upon itself the responsibility of going to Oklahoma and setting up a program that would satisfy the public need. Instead, they had their contractor do it with a simple contract system, and it cost everybody a lot of wasted time and grief.

Mr. ENGLISH. I think that's a good point, an excellent point. I think that's true, because the fact is, in Oklahoma we don't hear a lot of—nobody's kicking up a fuss about the sludge that's produced in Oklahoma being deposited on the land. We don't hear anything about it.

Well, again, I thank you very much. We appreciate the testimony and we appreciate the words, and thanks for coming today.

Let me say before I recess that we have had some of our invited witnesses that were unable to appear today but have indicated a desire to submit a written statement for the record. So without ob-

jection, we'll leave the record open for 10 days for that testimony, and we may have some additional questions for you. I don't anticipate any right now, but if we do, we'd appreciate a timely response to those.

With that, again, thanks, and we'll recess, subject to the call of the Chair.

[Whereupon, at 12:40 p.m., the subcommittee was adjourned, to reconvene, subject to the call of the Chair.]

[Material submitted for inclusion in the record follows:]

57-730 O - 92 - 3

Statement of
Galen S. Bridge
Associate Chief, Soil Conservation Service
United States Department of Agriculture

before the
Subcommittee on Conservation Credit & Rural Development
Committee on Agriculture
United States House of Representatives

Concerning H.R. 4360
To Carry Out a Program to Help Ensure the
Safe and Effective Use of Sludge
April 2, 1992
Washington, D.C.

MR CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE

I am pleased to have the opportunity to testify before you today to discuss H.R. 4360, a bill to amend the Soil Conservation and Domestic Allotment Act to require the Secretary of Agriculture to carry out a program to help ensure the safe and effective use of municipal sewage sludge to improve soil fertility; and for other purposes.

With me today is Dr. Rufus Chaney, a Research Agronomist with the Agricultural Research Service. For 21 years, Dr. Chaney has been involved in evaluating the risk to soil fertility or food chain safety when using sludge on cropland and is considered one of the world's foremost authorities in this area.

First, Mr. Chairman, let me state our perception that the sponsors of the bill and the United States Department of Agriculture (USDA) share some common ideas about municipal sewage sludge:

- First, under proper policies and guidelines, sludge can be recycled safely as an organic nutrient.
- Second, the application of sludge fits within the "one plan" Total Resource Management Planning concept that USDA advocates.
- Third, the beneficial uses of sludge can establish a win-win situation — sludge is viewed as a resource — not waste; rural areas get a financial resource; alternative agricultural options are enhanced; certain soils can be restored or made more productive; and the environment is protected.
- Fourth, the research capabilities, technical abilities and the delivery system of the Department of Agriculture have a lot to offer the country and individual farmers as our society makes better use of municipal sewage sludge as a resource..

Under H.R. 4360, three USDA agencies would be given responsibility for making sure that sludge is applied safely and effectively — the Agricultural Research Service (ARS) , the Animal Plant and Health Inspection Service (APHIS), and the Soil Conservation Service (SCS).

H.R. 4360 specifies that sludge must be tested and declared safe before land application occurs. ARS is to set National guidelines as to what constitutes safe sludge, and APHIS is designated as the testing agency. SCS is responsible for providing technical assistance to ensure safe application of sludge on agricultural lands.

The bill also establishes penalties for unsafe sludge application and provides a system of user fees to pay for carrying out its provisions.

We share many of the same goals concerning sludge use. However, USDA has provided extensive comments on EPA's proposed sludge regulation. We anticipate that the final rule will reflect our comments, and therefore, we oppose H.R. 4360 at this time.

We would urge the Subcommittee to defer further consideration of this bill at least until it has had the opportunity to fully analyze the final rule once it is published later this year. It is our hope that both the Department and the Subcommittee will be satisfied with EPA's final rule. Were H.R. 4360 to be enacted, it would essentially require USDA to begin a regulatory process that EPA has been working on for more than a decade. This could cause confusion and could actually be detrimental to our goals for the beneficial use of sludge.

H.R. 4360 primarily pertains to sludge moving across State lines. While this will ensure that all States have an equal level of protection, it would also establish a dual system in many States. We feel it is best to have just one National standard, regardless of whether the sludge is of local origin or from another State. If properly implemented, a single National approach, such as provided by EPA's rulemaking, will be more efficient, more understandable, and provide satisfactory protection for human health and the environment.

Since the 1970s USDA has been a full and active partner with EPA and other Federal agencies as sludge policy has evolved. If the current rule under consideration meets our expectations, we will not need any new statutory

authority to continue to play a necessary and valued role in that process, and to continue our work with the agricultural community on the beneficial use of sewage sludge.

Only last year, USDA expertise was sought and used by other Federal agencies in the development of a new government-wide policy on the beneficial use of municipal sewage sludge on Federal land. We want to assure the committee that we expect to stay actively involved with EPA on relevant parts of its final rulemaking on sludge.

Although the bill is drafted as an amendment to the Soil Conservation and Domestic Allotment Act, it would conflict with the Clean Water Act. Under the Clean Water Act, EPA is responsible for promulgating sludge regulations, issuing permits and enforcement as necessary. The corresponding provisions in HR 4360 would unnecessarily duplicate that structure.

While the Administration does not yet have an opinion on amendments to the Clean Water Act, I can assure the Subcommittee that USDA would hope to be fully involved in any interagency discussions that might deal with the topic of agricultural application of municipal sewage sludge.

One area of agreement, Mr. Chairman, is that there is a need for increased research into the uses and applications of sludge, and we certainly support efforts in this regard.

Since the late 1960's, SCS, working through local soil and water conservation districts, has provided valuable guidance on the use of livestock manure, municipal sludge and wastewater for beneficial purposes. These organic materials have been successfully managed by agricultural producers and municipal generators through guidance provided in conservation plans.

As the subcommittee works through its deliberations on H.R. 4360, we encourage you to consider a key point: regardless of the program to be implemented, regardless of how many rules and regulations are promulgated, nothing happens until the action is applied at the field level. A delivery system which can implement programs at the local level is absolutely vital.

As you know, agricultural producers must currently comply with an increasing number of environmental requirements, and the possibility exists that more will come. USDA is very concerned that agencies unrelated to the Department will start requiring farmers to meet various goals. Some of these requirements may actually conflict with other statutory mandates. The Department believes that one comprehensive resource management plan for farmers, *that would meet all pertinent environmental requirements*, is vital to American agriculture. In that respect, USDA will strive to be involved in programs that affect farmers.

That concludes my prepared remarks. I appreciate the opportunity to testify before you today, and I will be happy to respond to any questions you may have.

TESTIMONY OF
MICHAEL B. COOK
DIRECTOR, OFFICE OF WASTEWATER, ENFORCEMENT AND COMPLIANCE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON CONSERVATION, CREDIT, AND RURAL DEVELOPMENT
OF THE
COMMITTEE ON AGRICULTURE
U.S. HOUSE OF REPRESENTATIVES

April 2, 1992

Good morning Mr. Chairman. My name is Michael Cook; I am Director of the U.S. Environmental Protection Agency's (EPA's) Office of Wastewater Enforcement and Compliance. My office is responsible for directing and overseeing the implementation of the National Pollutant Discharge Elimination System (NPDES) Program, the National Pretreatment Program, and the National Sewage Sludge Permitting Program. I appreciate the opportunity to address the Subcommittee on H.R. 4360, the "Soil Conservation and Domestic Allotment Act Amendments of 1992."

We at EPA are extremely interested in helping to ensure that sewage sludge may be safely and beneficially used on land. While we understand and appreciate your concerns on this subject as reflected in the legislative language of H.R. 4360, we believe that some elements of the bill are duplicative of several existing statutory and regulatory requirements. We also fear that the bill could, by adding a substantial number of new requirements to the existing framework, actually result in discouraging the beneficial use of sewage sludge. We further believe that the existing Clean Water Act and its implementing structure provides the means necessary for protecting human health and the environment and

satisfactorily addresses your concerns about the safe use of sludge in States where it was not generated.

I would like to provide a context for the Agency's position by summarizing several key areas: what we currently know about sewage sludge, the history of support of a policy of beneficial use of sewage sludge by EPA and its sister Agencies, and our regulatory programs for addressing municipal sewage sludge.

WHAT WE KNOW ABOUT SEWAGE SLUDGE

Sewage sludge is the byproduct of the treatment of wastewater at sewage treatment facilities. It consists of solids that are generated during the treatment of domestic wastewater. Sewage sludge contains organic matter and nutrients, such as nitrogen, phosphorus, calcium, sulfur, and magnesium. Before treatment to kill or remove them, sewage sludge also contains a variety of pathogenic organisms, such as bacteria, viruses, and protozoa. Sewage sludge may also contain chemical contaminants from household products, and industrial wastewater discharged to the sewer. Proper monitoring, pretreatment, and source control programs can help ensure that sludge quality is acceptable to allow it to be safely recycled as an organic fertilizer and soil amendment.

Roughly 15,600 publicly owned treatment works (POTWs) in the United States generate 7.7 million dry metric tons of sludge annually. This is approximately 64 pounds per person each year--an amount that should clearly cause some sober reflection about where it goes and what effect it may have on human health and the environment. We believe that sludge management choices essentially

boil down to two: (1) disposal in a landfill or via an incinerator (with ultimate disposal of ash in a landfill) or (2) beneficial use on land as an organic fertilizer and soil amendment.

BENEFICIAL USE OF SEWAGE SLUDGE

We at EPA believe strongly in a policy of "beneficial use" for sewage sludge. Processed sewage sludge is a natural fertilizer and is valuable for the organic nutrients it contains as well as its ability to physically stabilize disturbed soils. Sewage sludge is utilized throughout the United States in virtually every type of usage that requires a fertilizer or soil stabilizer: it is spread on agricultural land used to grow food or feed crops, it is used to increase forest productivity, and it is used to stabilize and revegetate construction sites and highway embankments, and to reclaim strip-mined areas and other disturbed lands. According to our most recent survey of a representative sampling of sewage treatment plants across the country, about half of the sewage sludge produced in the U.S. is currently being reused in one form or another--as a digested, dried, composted, or chemically stabilized soil additive.

It has been common practice for decades to use sludge in States other than where it is generated. Houston, Texas has been sending heat-dried sludge to Florida for use on citrus groves for more than 30 years. All sludge from the District of Columbia's Blue Plains wastewater treatment facility (1600 dry tons per day) has been beneficially used (as dewatered and composted sludge) in Virginia and Maryland since the mid-1970's with great benefit to

farmers. A recent successful project involved the shipment of 400 tons per day of dewatered sludge from the City of Los Angeles to Yuma, Arizona. This operation has helped transform the desert into a highly effective agricultural operation since 1988. I have brought along a description of this very effective and carefully controlled operation.

The beneficial use of sewage sludge goes beyond large scale application to agricultural land. Sewage sludge is also a commercially-valuable product; sludge products are sold to the public for garden, nursery, household, and lawn uses, and such sales are on the increase. Many cities are making their sludges into valuable products that are shipped all over the country. In California, for example, Kellogg Supply Company has, for over fifty years, been marketing products derived from Los Angeles County composted sludge throughout the western U.S. You may be familiar with bagged, heat-dried sludge products, like "Milorganite" from Milwaukee that have been sold throughout the U.S. for decades. Boston heat dries and sells a portion of its sludge to fertilizer manufacturers. Philadelphia, San Francisco/Oakland and Montgomery County, Maryland have sold a portion of their composted sludge in neighboring States. Closer to home, the grounds at Mount Vernon and the National Mall have benefitted from the use of composted sewage sludge products.

Over the years, the Department of Agriculture has performed excellent research regarding agricultural application of sludge,

and its on-the-ground presence makes a real contribution to federal efforts to increase the beneficial use of sludge.

There is another reason why beneficial use makes sense. Sludge, unlike many of the byproducts of our lives, can not be prevented. It will not go away. If sludge is not beneficially used, it must be disposed of through other means. Throughout the country our capacity to dispose of solid wastes is decreasing; the disposal methods available such as landfilling and incineration are increasingly unpopular and present potential pollution problems. (The ocean dumping of sewage sludge has been banned altogether.) Sewage sludge beneficial use is a perfect illustration of a situation in which recycling is more cost-effective and beneficial than disposal.

For years, EPA has formally endorsed the beneficial use of sludge on the land--in fact, EPA's support of beneficial sludge utilization has increased as we have improved our knowledge about sludge quality and its agricultural and environmental impacts. EPA is not alone in this regard; we have a history of coordinating with other agencies in support of the beneficial use of sewage sludge.

In 1981, the USDA, EPA, and FDA carefully analyzed available health and safety information on sludge use and disposal practices. These agencies issued a joint statement of policy and guidance on the use of sewage sludge in the production of fruits and vegetables. Together, we concluded that "the use of high quality sludges, coupled with proper management procedures, would safeguard the consumer from contaminated crops" and "minimize any potential

adverse effect on the environment"; and that, with use of the jointly-issued guidance, "the safety and wholesomeness of the fruit and vegetable crops grown on sludge-amended soils will be assured."

In 1982, EPA created an Intra-Agency Sludge Task Force to conduct a multi-media examination of sewage sludge management and develop a cohesive Agency policy. The Task Force recommended an integrated, comprehensive regulatory structure for sewage sludge management that would balance beneficial use with the protection of human health and the environment. The Task Force effort concluded with a policy supporting beneficial use of sewage sludge published in the Federal Register on June 12, 1984.

In 1983, over 200 health and environmental experts from the U.S., Canada, and Europe published a consensus document recognizing that "with proper management and safety allowances based on research data, land application is a safe, beneficial and acceptable alternative for treatment of municipal wastewater and sludges."

Most recently, in 1990 the Office of Management and Budget convened an Interagency Task Force (made up of EPA, FDA, TVA, and other agencies from the Departments of Agriculture, Defense, Energy, and Interior) to develop a consistent government-wide policy and to consider technical and scientific issues regarding the beneficial use of sewage sludge on the land. The Interagency Policy issued July 18, 1991, affirmed the existing Federal policy to advocate management practices for sewage sludge that provide for beneficial use of sewage sludge while maintaining environmental

quality and protecting public health. Allow me to read a few short excerpts from that document:

> "It is the policy of the Federal government that Federal land management agencies will consider beneficial use of municipal sewage sludge for fertilizer, soil conditioner, or other uses, when such uses enhance resources on the Federal lands, and are cost-effective, as determined by the appropriate Federal land management agency...This statement of policy reaffirms and supplements existing Federal policy with regard to sewage sludge...The weight of scientific evidence supports the presumption that beneficial use of sludge that is permitted by EPA or the States and is of such quality to ensure compliance with the permit does not present a significant risk to the environment when appropriately applied to land."

We know more than ever about sludge quality--and the news is good. In the summer of 1988 (June 3, 1988), we initiated the National Sewage Sludge Survey, or NSSS, in order to round out the data provided by the earlier 40-City Study and to provide a comprehensive data base regarding sludge quality and management nationwide. The NSSS surveyed the sludge use and disposal practices at approximately 479 POTWs and sampled and analyzed the sewage sludge at 180 of them. The survey provided a critical "snapshot" of sludge quality across the United States and gave us our first truly reliable assessment of current sludge quality and management.

The NSSS revealed that, in fact, sludge quality may well be better than we had expected. The survey provided a sound scientific basis for our policy of beneficial use, and demonstrated that it was in fact possible to reconcile beneficial use and environmental protection.

EPA'S REGULATORY PROGRAMS FOR ADDRESSING MUNICIPAL SEWAGE SLUDGE

We believe that the high quality of sludge that we are finding is attributable, in no small part, to the success of the National Pretreatment Program. One of the goals of this program is to keep industrial wastewater discharged into publicly owned treatment systems from adversely affecting sludge quality and impeding the beneficial use of sludge. With increasingly aggressive implementation of the National Pretreatment Program, we fully expect that sludge quality will continue to improve still further.

We recognize, as does Congress, that the beneficial use of sewage sludge requires some controls. Sewage sludge may contain toxic metals or organic pollutants that originate in the wastewater discharged to the treatment works by households, industrial, and commercial users. Inadequately or improperly treated sewage sludge may also contain pathogenic, disease-causing organisms.

In section 405(d) of the Clean Water Act, Congress directs EPA to regulate the use and disposal of sewage sludge on a comprehensive basis to address these concerns. The Act requires us to evaluate the potential impacts of sludge use and disposal methods and to identify pollutant concentrations that interfere with those methods. In response, EPA adopted criteria in 1979 for the management of sewage sludge that is used or disposed of on the land. The criteria, published at 40 CFR Part 257, represented the first step in our effort to protect surface waters, ground water, and food and feed crops grown on sludge-amended lands.

The 1987 Water Quality Act defined our mandate still further. It required EPA to promulgate regulations that: (1) identify toxic pollutants that "on the basis of available information on their toxicity, persistence, concentration, mobility, or potential for exposure, may adversely affect public health and the environment," and that (2) establish management practices and numeric limits "adequate to protect public health and the environment from any reasonably anticipated adverse effects" of those pollutants.

The long-awaited technical standards for use and disposal were proposed in February 1989 for public comment and will be promulgated in final form this Summer. They will apply to the beneficial use, surface disposal, and incineration of sewage sludge. (We estimate that 2729 POTWs and about 2 million tons are covered under land application).

The standards will be codified at 40 CFR Part 503, and will provide a consistent set of national standards that combine good science and implementable policy. The Part 503 standards will establish risk-based pollutant limits to protect sensitive human and environmental pathways. They are also expected to contain requirements to control pathogens and vector-attracting properties of the sludge.

The Part 503 standards are also expected to require management practices to guard against improper sludge application or site management, and in certain circumstances they provide further protection through site restrictions and labelling and information requirements. It should be noted, however, that we are considering

an approach that would impose less burdensome requirements on final use of certain high quality processed sludges. Finally, we expect the Part 503 rule would contain notification, monitoring, record keeping, and reporting requirements to ensure that affected parties--treatment works, sludge handlers and distributors, land appliers, and site owners--are aware of and in compliance with the Part 503 standards. It is important to recognize that the Part 503 standards are expected to be largely "self-implementing." By that, I mean the final standards would automatically apply to those parties covered by them and would be independently enforceable--whether or not a permit has been issued to the facility.

We have invested years and a great deal of money in developing a defensible scientific and regulatory basis for the Part 503 standards. EPA, working with technical experts outside the Agency --including USDA--screened over 200 pollutants to arrive at a list of pollutants for final regulation. In order to derive pollutant numeric limits that would safeguard public health and the environment from any reasonably anticipated adverse effects, we developed exposure assessment models to characterize the possible pathways over which pollutants in sewage sludge might reach humans, plants, or animals. Using maximum exposure assumptions in these models, as well as existing EPA criteria and standards for pollutants in other environmental programs and media, we developed and are now finalizing numeric limits. These numeric limits are expected to be tailored to the risks involved for each use and disposal practice. We believe the limits will be fully protective

of public health and the environment and that they will continue to foster the use of sludge as an economic resource.

We actively solicited public comment and scientific review of our standards. We proposed the standards on February 6, 1989; by the close of the comment period six months later, we received (and have since been addressing) some 6000 pages of comments from 660 commenters. We realize that there were some significant problems with the proposed rule. We have worked hard with USDA and others to make necessary improvements. The rule has undergone extensive peer review, another round of proposal and comment (November 9, 1990, NSSS announcement), and a continued infusion of new scientific information as well as a more accurate characterization, through the National Sewage Sludge Survey, of sludge quality and management practices nationwide. All of this has required close coordination with USDA, other government agencies, and affected parties. In fact, USDA has been part of a peer review panel involved in studying and revising EPA's risk assessment for land application of sewage sludge.

The 1987 amendments to the Clean Water Act also significantly strengthen EPA's ability to effectively implement the forthcoming technical standards as well as to take interim measures to protect public health and the environment from improper sludge use or disposal. This is to be accomplished by adding sewage sludge standards and requirements into National Pollutant Discharge Elimination System (NPDES) permits issued to publicly-owned treatment works (POTWs) and other treatment works treating domestic

sewage, unless the standards are included in permits issued under other Federal programs or State programs approved by EPA. The Act also gives us the authority to issue permits to facilities not already addressed under the NPDES program. In addition, the Clean Water Act provides that the standards will be enforceable against any user or disposer of sewage sludge covered by the standards, not just the treatment works. Furthermore, the 1987 amendments made violations of the standards punishable by administrative, criminal, and civil penalties.

Since the 1987 amendments, we have established an interim program to include conditions in permits issued to POTWs. These conditions include sludge quality monitoring and requirements to comply with existing Federal (40 CFR Part 257) and State regulations governing the use and disposal of sewage sludge, including land application. This interim program relies extensively on existing State programs and will be in effect prior to the promulgation of the Part 503 standards. The focus of the interim program is on POTWs, but there is also the flexibility to take other appropriate measures where necessary to protect public health and the environment (e.g., requirements for private firms applying processed municipal sludge to land).

This flexibility to address parties other than POTWs involved in land application and to deal with interstate movement of sludge gives EPA discretion to take different, and equally reasonable, approaches when beneficial use of sludge is at issue. In some cases, an EPA Region may decide that no action is needed because

there is no evidence to suggest that adverse environmental impacts will occur or that existing State requirements are adequate to address any potential problems. In other cases, an EPA Region may decide that even though adverse impacts are not anticipated, issuing a permit to the applier will reassure concerned parties that problems will not occur at the application site. States, of course, remain free to impose whatever requirements they deem appropriate under their own State programs.

After promulgation of the Part 503 standards, EPA's approach to regulating different parties involved in sewage sludge generation, use and disposal will be more standardized. The framework for the long-term permitting program was established in sludge permitting and State program regulations promulgated on May 2, 1989 (54 FR 18716). As part of these regulations, we included a framework for States to formally take on and implement the program in much the same manner as many States currently implement the NPDES program.

EPA was required by the 1987 amendments to develop these regulations in advance of the final Part 503 standards. Currently, we are evaluating whether changes are needed in the permitting strategy to accommodate the final Part 503 standards as well as current use and disposal practices, *including the interstate movement of sludge*.

Under the implementation regulations, all POTWs and other treatment works treating domestic sewage that are subject to the Part 503 standards, must submit permit applications within 120 days

after Part 503 is promulgated. The regulations define treatment works treating domestic sewage as "a POTW or any other sewage sludge or waste water treatment devices or systems, regardless of ownership (including Federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge." This definition includes facilities that generate, treat, store, recycle, or dispose of sewage sludge. Additionally, under the Federal program, the permitting authority maintains the ability to designate others as treatment works treating domestic sewage and issue them a permit. The combination of this system and the direct enforceability of the technical standards against users or disposers of sewage sludge allows us to regulate all parties involved in land application of sewage sludge.

When a facility applies for a permit, it is required to submit a description of its sewage sludge use or disposal practice. For land application, this includes the name of the person that applies the sludge to the land if that person is different from the applicant. Additionally, the applicant must submit information necessary to determine whether the applicant can comply with the Part 503 standards. (However, as I mentioned earlier, we envision that the final Part 503 standards will provide that certain high quality sewage sludge products would not be subject to extensive on-site management practices.)

In many cases, a treatment works will not know all sites on which its sludge will be applied over the term of the permit

(typically 5 years). In this case, the treatment works would submit a land application plan. This plan must describe the geographical area covered by the plan, the selection criteria for the land, and a description of how the land will be managed. The plan must at least require advance notice to the permitting authority as well as the landowners and occupants adjacent to or abutting the proposed land application site. The plan must also provide for advance public notice of the land application as required by State and local law.

Under these procedures, sewage sludge will not be applied in any State without advance notice. What we are still considering is how best to ensure effective notice to the jurisdiction in which the sludge is applied so that it has an opportunity to develop any additional controls that may be appropriate. Good communication will be essential in this scenario--particularly since one State is issuing the generator a permit while the sewage sludge is ultimately applied to the land in another State.

In certain cases, sewage sludge may be subject to two or more permits. For example, the generator of sewage sludge is required to be permitted. If that generator sends its sewage sludge to a commercial facility that changes the quality of the sewage sludge before applying it to land, the commercial facility also has to have a permit. When a generator sends its sludge to a user or disposer not defined as a treatment works treating domestic sewage, that entity is not necessarily required to have a permit under the Federal program, although it would be subject to certain self-

implementing provisions of Part 503. I say this entity does "not necessarily" need to get a permit because EPA, when it is the permitting authority, maintains the ability to designate entities as treatment works treating domestic sewage and issue them permits. USDA has a formidable on-the-ground presence which could prove very helpful to all concerned with agricultural use of sludge. EPA is organized on a Regional basis, and does not have the same local capability. We will want to consult further with USDA to see how we might benefit from that capability. States, whether or not they are administering an EPA-approved program, have flexibility to regulate users or disposers as they see fit. This can provide the type of individual control envisioned by the proposed legislation.

EPA'S SPECIFIC COMMENTS ON H.R. 4360

Now that I have described our program, let me turn to discuss some specific provisions in H.R. 4360 and how they relate to what we are currently doing. The legislation sets forth a system where sludge bound for application to agricultural lands (as defined by the bill) must be analyzed and determined to be safe, the land on which the sludge is to be applied must be determined to be suitable, and the rate and frequency of sludge application must be approved. Our current and evolving program essentially does this. We have developed specific pollutant limits and control the amount of pollutants that may be applied over a period of time. In developing regulations, we have also been considering the same factors as those required under the bill for determining the suitability of the land for sewage sludge application. For

example, we account for the soil quality, soil management practices, topography, and climate to ensure a protective base and also provide an option for considering site-specific criteria.

The methods for applying the sludge to agricultural lands and for alleviating the effects of any spills must be approved under the bill. Once again, our program does this. It addresses these issues under our management practice requirements which would apply to all but certain high-quality processed sludges. The Clean Water Act and EPA's permitting regulations also provide broad authority to develop conditions on a case-by-case basis to protect human health and the environment.

Certain areas must be restricted to protect surface and ground water under the proposed legislation. In like fashion, the Part 503 standards under consideration are expected to address ground-water and surface water concerns through management practice requirements. We are considering management practice requirements which would prohibit sludge from being applied to land which is flooded, frozen or snow-covered so that the sludge does not enter waters of the U.S. or wetlands. Similarly, in the draft regulations under consideration, sludge might be prohibited from being applied to land that is 10 meters or less from waters of the U.S.--again to prevent sludge from entering such waters. Ground water might be protected by requiring the application of sludge equal to or less than the agronomic rate.

The bill would also require the party owning or controlling the sludge to agree in writing to be responsible for applying the

sludge in compliance with any conditions on the application and for alleviating any adverse effects resulting from the application. The proposed Part 503 rule would have required an agreement under our program between the treatment works and the applier. We would expect the final Part 503 rule to require the treatment works to inform the applier of what must be done to comply with the standards. In any event, the appliers would be directly responsible for the application of sludge under the Part 503 regulations and may be subject to additional requirements under a permit.

Under the bill, the landowner must grant authority for the SCS to conduct inspections. The Clean Water Act already allows EPA to oversee and inspect use and disposal of sewage sludge.

Finally, the proposed legislation sets forth a civil penalty system for persons who apply sludge to land in violation of its provisions. We agree that such a system is important in controlling the use and disposal of sewage sludge, and the Clean Water Act already provides administrative, civil, and criminal penalties to punish and deter users or disposers of sewage sludge not complying with the regulations. Furthermore, for the most part, the penalty amounts under the Clean Water Act are more stringent than those provided in the proposed legislation. As noted earlier, many States have similar enforcement penalties available for sludge violations. In light of these systems, the bill's penalty provisions are unnecessary, and duplicative.

We recognize that the interstate transfer of sludge cam be politically sensitive. However, States already have sludge management programs in place. The creation of a rigid, inflexible, and potentially expensive approval process administered by another Federal agency as envisioned by H.R. 4360 is unnecessary. It would likely be a costly and unnecessary new regulatory burden, and potentially disruptive to the agricultural community. We believe that such a process would overlap with, and in some cases, contradict EPA and State sludge management programs. It is not justified by our current knowledge about the risks posed by the land application of sewage sludge. We believe that the proposed legislation will effectively halt the interstate transport of sewage sludge that is destined for beneficial use by the additional requirements that would be imposed. Moreover, we believe that the proposed legislation would have an overall adverse impact on beneficial use of sewage sludge by fostering a negative image of sewage sludge, thus forcing less attractive sludge disposal options which offer no beneficial use opportunities, and indeed may be more likely to pose environmental problems.

In conclusion, we believe that beneficial use of sludge should be carefully regulated in a manner tailored to the risks involved. We should facilitate and encourage beneficial use of high quality sludge both to help communities that generate the sludge, and those persons who need a reasonably-priced fertilizer and soil conditioner.

This concludes my prepared testimony. I have a number of informative documents, regulations, and policies I would like to enter into the record. I would be happy to answer any questions you may have.

* * *

STATEMENT OF
THE NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS

BEFORE THE

HOUSE AGRICULTURE SUBCOMMITTEE ON
CONSERVATION, CREDIT & RURAL DEVELOPMENT

CONCERNING H.R. 4360

APRIL 2, 1992

Mr. Chairman and members of the subcommittee, my name is Anthony C. Haynes and I serve as the Director of Government Affairs for the National Association of Conservation Districts. NACD appreciates your invitation to provide the subcommittee with our views on H.R. 4360.

Mr. Chairman, as you know, conservation districts have been involved in implementing conservation programs and measures for over 50 years. They have played important roles in many federal programs including the 1985 and 1990 Farm Bills, Clean Water Act, Small Watersheds Program and others. In fact, conservation districts were conceived in 1937 to assist in the coordination and local delivery of federal soil and water conservation programs. Since then, conservation districts and the Soil Conservation Service (SCS), have shared information, resources and staff in addressing many of our nation's natural resource conservation and management issues.

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Conservation districts have been concerned with the increasing problem of disposal of sewage sludge. NACD commends the subcommittee for its interest in this important issue. We also appreciate the insight the chairman shows in bringing the issue of sludge management forward.

Sewage sludge contains both harmful and beneficial microorganisms, bacteria and organic and inorganic components. With adequate testing and sampling, coupled with proper application and monitoring, the use of sewage sludge can serve as a valuable resource for soil conditioning and fertility enhancement.

H.R. 4360 designates the United States Department of Agriculture (USDA) as having responsibility for ensuring the safe, effective application and use of sewage sludge on agricultural lands. However, NACD feels the lead role in regulating sludge application and in setting standards for sewage sludge programs should be maintained by the Environmental Protection Agency in cooperation with state and local governments. We feel that USDA's best role would be in providing technical assistance for site specific planning. Conservation districts also could provide a valuable system of local checks and balances by approving the sludge application plans developed by SCS, in much the same capacity as in their approval of conservation plans under the 1985 and 1990 Farm Bill's Highly Erodible Land Conservation Provision.

Under this program, known as conservation compliance, farmers are required to develop and implement conservation plans that are approved by the local conservation district. NACD urges that conservation districts be assigned a similar responsibility to approve application plans submitted by SCS. Further, conservation districts should also receive the appropriate compensation for local resources expended for assistance provided to the program.

Given the USDA's current budget constraints, NACD supports holding generators of sludge material financially accountable to offset expenses incurred in program implementation.

Regarding quality assurance in testing and sampling of sludge material, NACD feels that the generator of sludge that is to be shipped interstate should provide a certified analysis of any sludge material from a private independent laboratory that has been approved by the Environmental Protection Agency. This would avoid severely straining the resources of the Animal Plant Health Inspection Service (APHIS).

NACD also requests that further research be authorized by the subcommittee to study utilization and long-term effects of sewage sludge application.

That concludes my remarks Mr. Chairman. I will be glad to entertain any questions you may have.

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Testimony

on Behalf of

NATIONAL CATTLEMEN'S ASSOCIATION

regarding

H.R. 4360, a proposal for a program to ensure safe and effective use of municipal sludge on agricultural land.

before the

House Conservation, Credit, and Rural Development Subcommittee

submitted by

Chandler Keys, Director of Congressional Relations
National Cattlemen's Association

April 2, 1992

The National Cattlemen's Association is the national spokesman for all segments of the beef cattle industry -- including cattle breeders, producers, and feeders. The NCA represents approximately 300,000 cattlemen. Membership includes individual members as well as 47 affiliated state cattle associations and 31 breed associations.

Mr. Chairman, thank you for inviting the National Cattlemen's Association to testify today regarding your bill HR4360. While the National Cattlemen's Association does not have specific policy regarding the safe and effective use of municipal sludge, cattlemen do take an active role in promoting proper land stewardship.

Since cattlemen operate on more land than any other segment of agriculture, NCA feels compelled to take the steps necessary to protect land from possible degradation by promoting sound production practices that ensure long term productivity. We strongly believe the goal of land stewardship is best achieved through education and research that fuels voluntary action.

With that philosophic statement in mind, NCA does have a stake in the issue of using municipal sludge as a fertilizer on agricultural land. No one disputes the need to find a safe and effective way to dispose of municipal sludge. Without an avenue of disposal, sludge would quickly overwhelm waste water systems in our cities and towns. The question then, is how to utilize the product without creating problems. Clearly, we cannot simply dump sludge on farm and ranch land in a wholesale manner without guidelines and protection for the landowner. The farmer or rancher has to be protected from environmental risks that could lead to degradation of land, water, crops, livestock and human health. Every step should be made to greatly minimize any adverse ramifications. The question of liability also must be taken into account. The real possibility exists that a landowner, after complying with all the current stipulations, could apply sludge and somewhere down the road be faced with unknown circumstances and found to be liable for degradation of his or neighboring assets. Long term monitoring of sludge application sites may be necessary to protect against this possibility.

NCA would like to point out the tremendous differences between animal manure and municipal sludge. Animal manure is produced in a controlled environment where the likelihood of contamination by outside toxins is extremely remote. Municipal sludge, however, is produced in an uncontrolled environment where the risk of contamination by toxins is a known phenomenon. Records show that nickel, tin, copper, lead, mercury and other heavy metals are regularly found to contaminate sludge. Other chemical substances such as asbestos, PCB's and dioxins have also been found in municipal sludge. Because of this significant difference, NCA would strongly oppose any suggestions that land application of manure should be treated in the same manner as municipal sludge land application, as outlined in HR4360.

NCA strongly supports your efforts to give USDA the leading role in carrying out the mandate of HR4360. The Soil Conservation Service and Extension Service have a long history of voluntary cooperation with farmers and ranchers. The type of farm-by-farm analysis outlined in the bill to ascertain whether or not sludge could be used is the type of target approach farmers and ranchers prefer. This should be a goal of other government programs, rather than broad based "blanket" approaches.

The debate surrounding the application of municipal sludge on agricultural land needs to continue. The agricultural community must insist on sound research followed by intense education on safe and effective ways to use municipal sludge on rural lands.

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Statement of the
Association of Metropolitan Sewerage Agencies
before the
Subcommittee on Conservation, Credit and Rural Development
of the
House Committee on Agriculture
on
Sludge Management
and
H.R. 4360, the Soil Conservation and
Domestic Allotment Act Amendments of 1992
April 2, 1992

Testimony Provided by
Dr. Cecil Lue-Hing
Chair, AMSA Sludge Management Committee
Director, Research & Development
Metropolitan Water Reclamation District of Greater Chicago

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Mr. Chairman and members of the Subcommittee, I am Dr. Cecil Lue-Hing, Director of Research & Development for the Metropolitan Water Reclamation District of Greater Chicago (District). I have been directly involved in the District's municipal sludge management activities for the past 20 years. In addition to serving in this capacity, I am a Board Member and Sludge Management Committee Chair of the Association of Metropolitan Sewerage Agencies (AMSA). AMSA members represent over 140 of the nation's largest wastewater treatment agencies. We serve nearly 100 million of the 176 million or 57 percent of the total sewered population in the United States, and collectively treat over 13 billion gallons of wastewater each day.

I am pleased to have the opportunity to appear before the Subcommittee today to provide AMSA's views concerning the management of municipal sewage sludge and H.R. 4360, the Soil Conservation and Domestic Allotment Act Amendments of 1992.

Sludge Management

The management of municipal sewage sludge is one of the most important aspects of water pollution control facing AMSA's membership today. Virtually every community in the United States, whether urban or rural, produces municipal sludge which must be managed in an environmentally acceptable way. The United States Environmental Protection Agency (USEPA) data indicate there are more than 15,000 publicly-owned treatment works in the United States which produce nearly 500,000 wet tons of sludge every day.

While unfounded, the public today has a generally negative perception regarding municipal sludge. AMSA has been working with the USEPA to change this perception in order to promote the beneficial uses of sludge which include use as a fertilizer, soil nutrient, and for energy production.

I would like to first bring to the attention of the Subcommittee the Interagency Policy on the Beneficial Use of Municipal Sewage Sludge on Federal Land, which appeared in the Federal Register on July 18, 1991 (56 FR 33186). The policy, which is in Attachment Number 1 to my testimony, is designed to clarify the Federal government's policy, and guides Federal land management agencies when considering the beneficial use of municipal sewage sludge on Federal land. The statement reaffirms and supplements existing Federal policy by advocating those municipal sludge management practices that promote beneficial uses of sludge while maintaining environmental quality and protecting public health.

The interagency policy was developed by a task force comprised of the Departments of Agriculture, Defense, Energy, and Interior; USEPA; the Food and Drug Administration; and the Tennessee Valley Authority. Under the policy, Federal land management agencies must consider beneficial use of municipal sewage sludge for fertilizer, soil conditioners, or other uses, when such uses enhance resources on Federal lands, and are cost-effective.

The Interagency Task Force concluded that several decades of experience with municipal sewage sludge has demonstrated that this material can be a valuable resource. Recycling of municipal sludge through beneficial use projects can serve natural resource management and other societal objectives. An extensive literature review also has not revealed any scientific evidence suggesting that beneficial use of sewage sludge causes harmful physical, physiological, or behavioral effects on animals and plants when sludge is applied to land in compliance with applicable permits and regulations.

USEPA's Part 503 Municipal Sewage Sludge Regulations

AMSA believes that H.R. 4360, while well intentioned, will establish a regulatory structure for municipal sewage sludge which unnecessarily replicates the regulatory program of the USEPA.

Today, I would like to present to you information which demonstrates that the USEPA will shortly have in place a comprehensive regulatory structure designed to control the utilization of municipal sewage sludge not only for application to agricultural land but for other sludge management options as well.

H.R. 4360 would mandate:

> "the Secretary of Agriculture to establish a program to ensure the safe and effective application of sludge to agricultural land, if the agricultural land to which the sludge is to be applied is in a state other than the state in which the sewage sludge is generated."

While AMSA concurs with the sponsors of H.R. 4360 as to the importance of ensuring the safe and effective application of sludge to agricultural land, we disagree that the need exists for such legislation, in light of the comprehensive USEPA 40 CFR Part 503 Regulations for the Use and Disposal of Sewage Sludge.

The USEPA has spent tens of millions of dollars over the past two decades to promote the research necessary to develop the Part 503 sludge regulations, which are due to be promulgated in July 1992 under terms of a U.S. District Court Consent Decree. These regulations are comprehensive, and set numerical limits for trace metal and organic contaminant concentrations in sludge, and for loading rates on land. The rule governs sludge incineration, monofilling, surface disposal, distribution and marketing, and application of sludge to agricultural and nonagricultural land (Figure 1).

The rule also dictates sludge management practices. Unlike H.R. 4360, USEPA's Part 503 regulation will govern all application of sludge to land, agricultural as well as nonagricultural, and will apply regardless of whether the land application occurs in the same state in which the sewage sludge was generated.

In addition to research expenditures, the USEPA, through Congressional mandates has awarded several billion dollars under the Construction Grants Program to all fifty states to build sludge treatment and processing facilities many of which were designed to produce sludges appropriate for use on agricultural land.

USEPA's Part 503 regulations are risk-based, and have been developed to protect "most exposed individuals," including humans, animals, plants or soil biota, from adverse effects of sludge-borne trace metal and organic pollutants. The regulation, by considering the risk imposed by all sludge management practices, provides a balanced, holistic approach to governing sludge use, which promotes beneficial use of sludge while minimizing overall risk to human health and the environment.

In contrast, H.R. 4360, by focusing on and regulating only one of the many sludge management options practiced today, would act as a deterrent to beneficial use of sludge in agriculture.

The risk assessment utilized in USEPA's Part 503 regulation for application of sludge to agricultural land is very thorough. This regulation includes modeling for the transfer of trace metal and organic contaminants of sludge through 14 terrestrial, aquatic, and atmospheric pathways to most exposed individuals (Figure 2, 3, 4,).

The risk assessment model is also very protective of the food chain. Risk to children and animals who directly ingest sludge-amended soil was determined. Risk to humans who consume products derived from animals grazed on sludge-amended soils, or raised on food crops from sludge-amended soils, was determined. Risk of toxicity to plants and soil biota growing or living in sludge-amended soil was determined, and risk to animals that ingest soil biota from sludge-amended soils was determined.

To protect the Nation's water resources, the USEPA determined risk to humans from drinking groundwater extracted from beneath sludge-amended soil, and risk to humans and local fauna from drinking, or living in or near, surface water receiving runoff from sludge-amended soil. The Part 503 rule also considered risk to humans from breathing vapors or air-borne dust from sludge-amended soils. Additionally, the USEPA has set pathogen reduction standards for sludges that are land applied. Needless to say, this approach is extremely protective of human health and the environment. It is very conservative.

The USEPA's Part 503 rule is further protective in that it not only considers the risks to human health and environment from application of sludge to existing agricultural land, but also considers risks that may be posed if sludge-amended lands, not currently utilized for agricultural purposes, are converted to agricultural use or urban development. The final Part 503 rule will also have provisions for consideration of site-specific conditions to provide the utmost environmental control.

Under the direction of Dr. Alan Rubin, Chief of the Sludge Risk Assessment of the USEPA's Office of Water Regulations, the USEPA has based its risk assessment on the vast body of scientific information that has resulted from over two decades of research by the USEPA, analyzed and coordinated by Dr. James A. Ryan, Soil Scientist, USEPA Risk Reduction Engineering Laboratory, and Dr. Rufus Chaney, Research Agronomist, Environmental Chemistry Laboratory of the United Stated Department of Agriculture (USDA). These agencies, including the USDA Cooperative State Research Service Technical Committees NE-90, NC-118, W-124, and W-170, have cooperated in directing and participating in several regional research projects on land application of sludge. These technical committees were comprised of researchers from the USEPA; the USDA, including Dr. Rufus Chaney, who is an internationally respected expert on land application of sludge; the Metropolitan Water Reclamation District of Greater Chicago; the Tennessee Valley Authority; and land grant universities in Illinois, Indiana, Wisconsin, Ohio, Michigan, Pennsylvania, Maryland, New York, New Jersey, Kansas, Florida, North Carolina, Oklahoma, New Mexico, Montana, Washington, Wyoming, California, and Hawaii. Hundreds of technical publications, and several books have resulted from these massive efforts, which brought together the most highly regarded sludge researchers in the country. Collectively, these researchers have produced a comprehensive body of information that has enabled the USEPA to produce a scientifically sound risk-based rule.

The USDA has been an active partner with the USEPA throughout the development of the Part 503 sludge regulation, from participating on technical committees that produced the scientific information upon which the risk assessment is based, to providing important comments on the technical basis of the rule through the Peer Review process. Attachment Number 2, the foreword from the comments of the W-170 Committee's Peer Review of USEPA's Part 503 rule, documents the long history of research and cooperation that has been put forth by USEPA and USDA on land application of sludge. Attachment Number 2 also summarizes some of the significant achievements of these efforts, and lists participants in the Peer Review of the technical basis of the Part 503 rule. In light of the close cooperation that has existed between the USDA and USEPA during development of the Part 503 rule, it is unlikely that the program that H.R. 4360 would mandate USDA to implement would improve upon the requirements imposed by the USEPA in 40 CFR Part 503. We believe that the provisions in H.R. 4360 would unnecessarily burden the practice of application of sludge to agricultural land by increasing its cost, and unfairly targeting only sludges that cross state lines prior to their application to agricultural land.

AMSA has actively cooperated with the USEPA during development of the Part 503 Regulations. In fact, AMSA was instrumental in facilitating the W-170 Committee's Peer Review of the Part 503 Regulations, which resulted in an increased level of scientific data and expertise being brought to bear as the regulations were developed. AMSA believes that the USEPA's Part 503 Regulations will allow municipal sludge to be economically managed in an environmentally acceptable way consistent with our shared priority of protecting public health and safety, and the environment.

State Sludge Management Programs

In 1987, Congress amended section 405(d) of the Clean Water Act and reaffirmed its intention that USEPA develop comprehensive sewage sludge regulations which:

> "...shall be adequate to protect public health and the environment from any reasonably anticipated adverse effects of each pollutant..."

The USEPA will fulfill this Congressional mandate with the promulgation of the 40 CFR Part 503 Sewage Sludge Regulations, this summer.

In addition to the high level of protection provided by the Part 503 regulation for public health and the nation's soil and water resources, the USEPA recognized that exceptional circumstances may exist that occasionally warrant stricter controls for implementation on a case-by-case or site-specific basis by state or local permitting authorities. This is evidenced in section 503.3 (Federal Register, volume 54, page 5877, February 6, 1989) where the USEPA states:

> "Nothing in this Part precludes states from imposing more stringent requirements for any sewage sludge use or disposal method covered by this Part."

USEPA will also require minimum frequencies at which treatment works must monitor and analyze their sewage sludge, minimum records that must be kept, and minimum required information that must be reported to the permitting authority to insure compliance. The USEPA also stated in section 503.80 (Federal Register, volume 54, page 5894, February 6, 1989) that:

> "...nothing in this subpart prevents the establishment of more stringent monitoring, record keeping, and report requirements for any practice covered by this part...".

This clearly indicates that the ultimate level of environmental control resides with the States, who have been granted considerable latitude in dealing with unique or exceptional circumstances. States may utilize this latitude to protect more sensitive ecosystems in their jurisdictions and can impose more stringent standards and management practices in programs that utilize sludges not ideally suited to application to agricultural land.

In a recent report entitled "Guidance for Writing Case-by-Case Permit Requirements for Municipal Sewage Sludge" (EPA Report 505/8-90-001, May 1990), the USEPA determined that all fifty states, as well as the District of Columbia and Puerto Rico, have sludge management programs that require issuance of permits or operating licenses for land application of sewage sludge. These states were also cited as having:

1. Numerical limits on soil loading of trace metal and organic contaminants,

2. Sludge nitrogen loading limits,
3. Management practice restrictions in some or all of the following areas:

   - sludge dewatering
   - pathogen control
   - sludge stabilization
   - sludge incorporation
   - climatic limitations
   - crop limitations
   - grazing restrictions
   - access control
   - siting limitations

Specifically, I would like to cite the requirements of two states, Illinois and Wisconsin, as examples.

The State of Illinois requires the following information as a minimum prior to issuing a permit:

1. Statement of where sludge will be stored.
2. Proposed rate and method of application of the sludge to the receiving site.
3. Quality (constituents and concentrations) of the sludge to be applied to the receiving site.
4. The geological and hydrological characteristics of the receiving site including proximity to waters of the state.

The State of Illinois further requires that all land applied sludge be digested and undergo stabilization, that soil pH be maintained at 6.5 or greater, that no truck farming fruits or vegetables be raised and that no applications be made to ice or snow covered land or to saturated ground. The State of Illinois dictates loading limits on specific pollutants and nitrogen and phosphorus on a site-specific basis and also specifies minimum set back distances from wells and surface waters. The State of Illinois often requires monitoring of soils, crops, groundwater, surface water and sludge in permits for sites that will receive repeated applications or reclamation scale loading rates. These reports are required on a quarterly or monthly basis depending on the permit.

The State of Wisconsin Department of Natural Resources (DNR) requires the following:

1. No POTW may land apply sludge without a permit from the DNR (Attachment Number 3 shows a portion of the DNR permit issued to the Madison Metropolitan Sewage District to illustrate the controls exerted by such permits).
2. POTWs must supply DNR with information on the physical, chemical and biological characteristics of the sludge at frequencies defined in the permit, using sampling and analytical methods specified by DNR.

3. Each potential land application site must be evaluated and approved by DNR prior to use. POTWs must submit a soil map and air photo for each site. Information must be given with respect to site ownership; land use of the site and adjacent properties; distances to nearest home, nearest public and private water supply; nearest surface water; and the type of crop to be grown or dominant vegetation type at the site.
4. Soil samples must be collected from the site prior to sludge application and at three year intervals following sludge application. Soil samples are used to determine the soil pH, nutrient levels and recommendations, and other information necessary to ensure the safe application of sludge.
5. DNR has evaluated all soil types in the state with respect to suitability for sludge application based on criteria such as soil permeability, depth to groundwater or seasonal high water table, depth to bedrock, etc. Sludge cannot be applied to unsuitable soils.
6. Landspreading is typically limited to sites with slopes of less than 12 percent to limit the potential for runoff, thereby protecting surface water resources.
7. Sludge application is limited to meeting the nitrogen requirement of the crop grown in order to protect groundwater resources.
8. Control of soil pH is required to minimize potential for plant uptake of metals.
9. Separation distances are established between land spreading sites and homes, surface water, wetlands, dry runs, and public and private water supply wells to protect surface and groundwater quality.
10. Waiting periods following sludge application are specified for certain practices to protect human and animal health.
11. A general requirement that sludge cannot be landspread at any site where such practice will have a detrimental effect on air, surface, or groundwater quality.
12. Annual reports must be submitted to DNR by POTWs documenting location of application sites, volumes applied, acreage, application rates for nitrogen and metals, method of application, and the results of any monitoring required by DNR.

The fact that all land application operations in the United States require permits, which subject the planned program to the Part 503 regulations and the scrutiny of local permitting authorities, virtually guarantees that public health and the environment will be protected from any adverse effects.

Prohibition on Application of Out-of-State Sludges to Agricultural Land

The provisions of H.R. 4360 would potentially prohibit the application of sludges

generated in a state to agricultural land in any other state, but would not apply to any sludges being applied to agricultural lands in the state in which the sludge was generated. This targeting of application of out-of-state sludge to agricultural land for additional regulatory control is not necessary because the controls proposed will not improve upon the comprehensive umbrella of protection that will be provided in the USEPA's Part 503 Regulations and the existing state permitting programs. However, H.R. 4360 may have adverse impacts on public health and the environment by promoting a confusing, and potentially contradictory regulatory framework which may also unnecessarily increase the cost of out-of-state land application programs. This bill would serve to discourage beneficial use of sludge through land application and may promote other less environmentally-protective sludge management practices.

The USEPA specifically developed the Part 503 Regulations to apply to all application of sludge to agricultural land nationwide, and made provisions for site-specific considerations. It makes no difference to public health or the environment whether sludges of prescribed quality that are applied to agricultural land are from in-state or out-of-state. When one considers that agricultural commodities and surface and groundwater readily flow across state lines, specifically targeting out-of-state sludge application to agricultural land is unnecessary and serves no sound public policy or regulatory purpose. Furthermore, this approach to sludge management has no basis in environmental or agricultural science.

Public Education Programs

As scientific research improves our understanding of the behavior of sludge-borne contaminants in the food-chain and the environment, and allows us to estimate risk more accurately, it is extremely important that this understanding be communicated to the general public. Currently, public misconception about the risks associated with utilization of sludge on agricultural land, rather than suitability of sludge, or availability of appropriate technology, is an important factor limiting the practice in the United States. Municipalities have gone to great lengths to develop industrial pretreatment programs and to apply technologies such as digestion and composting to ensure their final product will be of a quality suitable for application to agricultural land.

AMSA urges this Subcommittee to consider the importance of public education to the future success of programs, such as application of sewage sludge to agricultural land, which beneficially recycle materials that would otherwise be disposed of as wastes. The USDA is an ideal Federal entity to establish national public education programs, because they already have an effective network in place, namely through the Agricultural Extension Service. AMSA encourages Congress to make additional resources available to USDA for establishing a National Public Education Program on the Beneficial Use of Municipal Sewage Sludge. AMSA believes that Congress should also make additional resources available to support similar education programs conducted by the USEPA.

Recommendations

AMSA believes that the Part 503 sludge regulations will provide extensive oversight for the management and permitting of municipal sludges. The proposed legislation, H.R. 4360, is duplicative of this comprehensive regulatory framework and ignores the fact that USEPA and USDA have been for many years jointly considering the impacts of land application of sewage sludge. Promulgating a new set of USDA regulations at this time would not contribute to public health, safety or environmental goals, but would make it more difficult to meet the national goal of beneficial use of sludge. For these reasons, AMSA opposes H.R. 4360. AMSA does, however, recommend:

1. that Congress provide additional funding to the USDA and USEPA in order to support continuing research in this area. This will be the most effective way of ensuring that the nation's sewage sludge will be utilized in a manner that is both beneficial to agriculture and protective of environmental resources;
2. that Congress provide the USDA and USEPA with additional funding to support the development of public education programs to foster better public understanding of the application of sewage sludge to agricultural land and to promote greater public acceptance of the beneficial use of sewage sludge.

This brings my testimony to a close. Again, Mr. Chairman, many thanks for this opportunity to speak with you and the members of your Subcommittee. I would be happy to answer any questions that you may have at this time.

(Attachments follow:)

Figures

Municipal Sludge Management Practices Controlled by USEPA's Part 503 Regulations

- Land Application
  - Agricultural Land
  - Nonagricultural Land
    - Forest and Rangeland
    - Public Contact Sites
    - Soil Reclamation Sites
    - Dedicated Disposal Sites
    - Dedicated Beneficial Use Sites
- Distribution and Marketing
- Incineration
- Sludge-only Landfill
- Surface Disposal

Figure 1

Agricultural Land Terrestrial Pathways Protected by USEPA's Part 503 Regulations

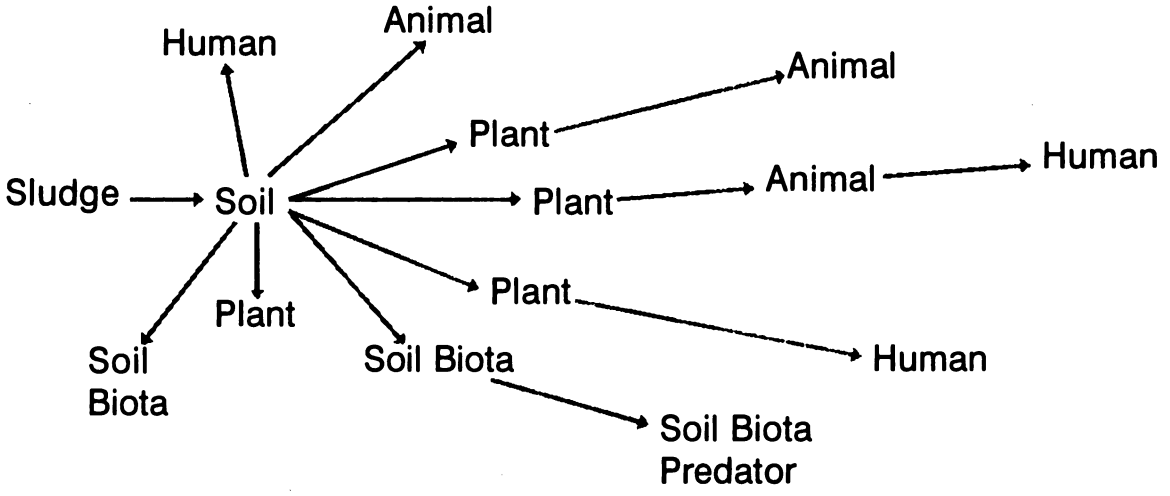

Figure 2

Agricultural Land Atmospheric Pathways Protected by USEPA's Part 503 Regulations

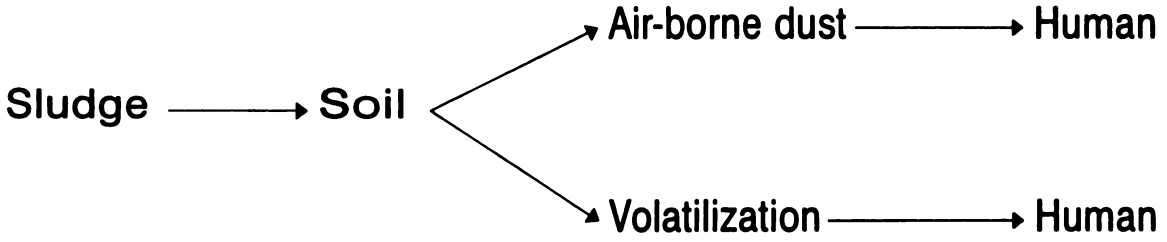

Figure 3

Agricultural Land Aquatic Pathways Protected by USEPA's Part 503 Regulations

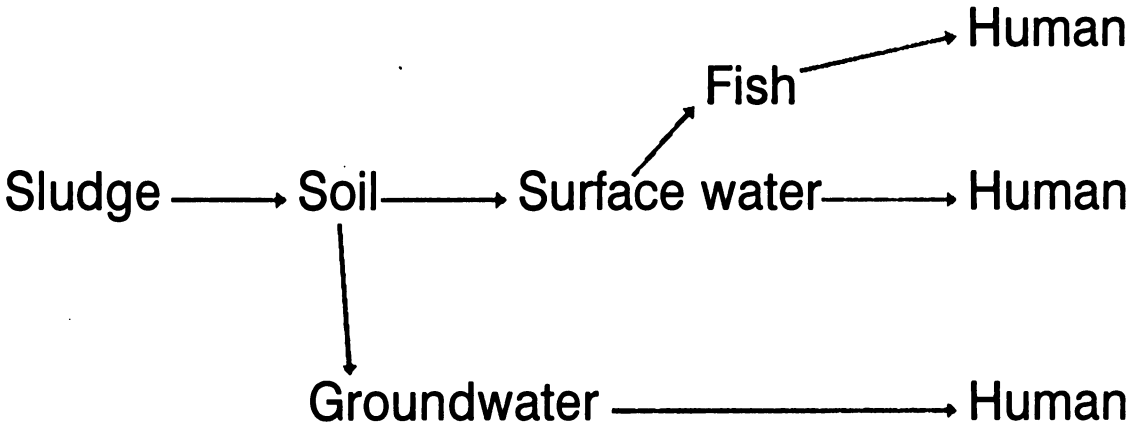

Figure 4

Attachment 1

Interagency Policy on Beneficial Use of
Municipal Sewage Sludge on Federal Land
(Federal Register, volume 56, pages 33186-33188,
Thursday, July 18, 1991).

federal register

Thursday
July 18, 1991

Part VIII

Environmental Protection Agency

Interagency Policy on Beneficial Use of Municipal Sewage Sludge on Federal Land; Notice

ENVIRONMENTAL PROTECTION AGENCY

[WH-FRL-3970-6]

Interagency Policy on Beneficial Use of Municipal Sewage Sludge on Federal Land [1]

AGENCY: Environmental Protection Agency.

ACTION: Notice of interagency policy on beneficial use of municipal sewage sludge on Federal land.

SUMMARY: The Office of Management and Budget (OMB) convened an Interagency Task Force in 1988 to develop a consistent policy regarding the beneficial use of municipal sewage sludge and to resolve any technical concerns over the scientific information available in this area. The policy announced today by EPA, on behalf of all the participating agencies, is a product of that Interagency Task Force effort. It is intended to clarify for the public the Federal government's policy and will guide the Federal land management agencies with respect to the beneficial use of municipal sewage sludge on Federal land. The statement reaffirms and supplements the existing Federal policy to advocate those municipal sludge management practices that provide for the beneficial use of sludges while maintaining environmental quality and protecting public health.

Dated: July 10, 1991.

William K. Reilly,

Administrator.

FOR FURTHER INFORMATION CONTACT:

U.S. Department of Agriculture: Mr. Larry Schmidt, Forest Service, Watershed and Air, 201 14th Street, SW., Auditors Room 3 So., Washington, DC 20250 (202) 453-9475.
U.S. Department of Defense: Mr. Ed Miller, Environmental Support Office, 206 N. Washington Street, Suite 100, Alexandria, VA 22314 (703) 325-2215.
U.S. Department of Energy: Mr. Jerry Coalgate, RCRA/CERCLA Division, Office of Environmental Guidance, GA-076 (Mailstop EH-23), 1000 Independence Avenue, SW., Washington, DC 20585 (202) 586-6075.
U.S. Department of the Interior: Mr. Larry Finfer, Mailstop 4412, Office of Program Analysis, 1849 C Street, NW., Washington, DC 20240 (202) 208-7786.
U.S. Environmental Protection Agency: Mr. Robert K. Bastian, Office of Wastewater Enforcement & Compliance (WH-547), 401 M Street, SW., Washington, DC 20460 (202) 382-7378.
U.S. Food and Drug Administration: Mr. Thomas Fazio, Office of Physical Sciences (HFF-460), 200 C Street, SW., Washington, DC 20204 (202) 472-5182.
Tennessee Valley Authority: Mr. Paul Giordano, F-137 NFERC, Muscle Shoals, AL 35660 (205) 386-3460.

[1] This is a corrected reprinting of the document that appeared in the Federal Register issue of July 2, 1991 (56 FR 30466).

Statement of Policy

Interagency Policy on Beneficial Use of Municipal Sewage Sludge on Federal Land

I. Purpose and Need

The Federal government seeks to promote the cost-effective use of recycled materials in American society. One such material, municipal sewage sludge, has been used extensively as a fertilizer and soil conditioner in this nation and elsewhere over a number of years. Municipal sewage sludge is any residue removed during the treatment of municipal wastewater and domestic sewage. Recently, there has been some uncertainty about the policy of the Federal government toward the beneficial use of municipal sewage sludge. This statement is intended to clarify for the public the Federal government's policy. It also provides guidance to Federal land management agencies, with respect to the beneficial use of municipal sewage sludge on Federal lands. These agencies may choose to elaborate on this policy by developing and publishing additional agency-specific guidance.

This statement relates solely to the beneficial use of municipal sewage sludge on land. "Beneficial use" means any application of sludge to land specifically designed to take advantage of the nutrient and other characteristics of this material to improve soil fertility or structure and thereby further some natural resource management objective. Disposal of sludge, which is characterized by an emphasis on isolating, incinerating, or otherwise placing sludge without an associated natural resource management objective, is treated elsewhere in applicable law and regulation. Sludge treatment practices in advance of final use are also not considered to be beneficial uses.

This statement was developed by an interagency task force, facilitated by the Office of Management and Budget, and comprised of representatives of the Departments of Agriculture, Defense, Energy, and Interior, as well as the Environmental Protection Agency, Food and Drug Administration, and the Tennessee Valley Authority. These agencies concur in this document, and will seek to implement it as is appropriate in their respective cases.

II. Beneficial Use Policy

It is the policy of the Federal government that Federal land management agencies will consider beneficial use of municipal sewage sludge for fertilizer, soil conditioner, or other uses, when such uses enhance resources on the Federal lands, and are cost-effective, as determined by the appropriate Federal land management agency.

Where the agency determines that a proposal to apply sludge to Federal lands constitutes a beneficial use that is consistent with the agency's resource management objectives, it is expected that the agency can take advantage of the proposal to beneficially use municipal sewage sludge, unless the agency's analysis reveals (1) legal or programmatic obstacles, (2) evidence indicating significant adverse environmental effects, or (3) excessive agency costs relative to the natural resource benefits and the applicant's opportunity cost.

III. Relationship to Existing Policy

This statement of policy reaffirms and supplements existing Federal policy with regard to sewage sludge (i.e.: "Land Application of Municipal Sewage Sludge for the Production of Fruits and Vegetables, a Statement of Federal Policy and Guidance", adopted by the Environmental Protection Agency, Food and Drug Administration, and the Department of Agriculture, 1981; and "Policy on Municipal Sludge Management", adopted by the Environmental Protection Agency on June 12, 1984, 49 FR 24358).

This statement is not intended to conflict with any statutory or regulatory requirement which guides the programs of the agencies concurring in this document.

IV. Findings Regarding the Beneficial Use of Sewage Sludge

Several decades of experience with municipal sewage sludge has demonstrated that this material can be a valuable resource. Recycling it through beneficial use projects can serve natural resource management and other societal objectives.

The weight of scientific evidence supports the presumption that beneficial use of sludge that is permitted by EPA or the States and is of such quality to ensure compliance with the permit does not present a significant risk to the environment when appropriately

applied to land. However, given the wide variety of physiographic and biological conditions in the United States, the final determination as to the environmental effects of a specific project must take into consideration the particular characteristics of the sludge, the resources, and the land to which it is proposed to be applied.

1. *Human Health and Safety.* There is no existing scientific evidence of significant human health risk from municipal sewage sludge that is produced and applied to land in compliance with applicable sludge permits and regulations.

2. *Biological considerations.* Municipal sewage sludge that meets all applicable state and federal standards, which is applied consistent with permit conditions, and which is applied to land in amounts intended to meet the soil fertility requirements of vegetation, can generally be presumed to be safe for biota. However, the Federal land manager who is considering beneficial use of municipal sewage sludge may wish to investigate the specific characteristics of both the sludge and the site to which it may be applied. There is always the possibility that unique local conditions or sludge characteristics may make sludge application more or less appropriate than would otherwise be the case.

An extensive literature review has not revealed any scientific evidence suggesting that beneficial use of sewage sludge has been demonstrated to cause harmful physical, physiological, or behavioral effects on animals and plants when sludge is applied to land in compliance with applicable permits and regulations. Under some conditions, certain species of plants and animals have been found to concentrate metals or organic chemicals present in sludge within certain of their tissues. This has typically happened when sludge application rates were high and the sludge was relatively highly contaminated. However, contaminants found in the tissues of those plants and animals exposed to sewage sludge have not been demonstrated to have had any harmful effect on those organisms, and the tissue contaminant levels found in those organisms are generally within the range of values that can be found in members of those species inhabiting areas without sludge-amended soils.

Organisms relatively low on the food chain have been the subject of most of the relevant investigations. More scientific information is needed with respect to bioaccumulation of contaminants found in sewage sludge by predators in various ecosystems. Better information on sewage sludge contaminants in predators will be particularly helpful when management of such species is receiving emphasis in applicable land use or resource management plans.

3. *Ecological considerations.* Beneficial use is intended to improve soil conditions. At the ecological level these changes are likely to be expressed in increased overall productivity, and may be reflected in potentially significant changes in the structure, diversity, or richness of the pre-existing plant and animal community. The nature and rate of these changes may be affected not only by the physical and chemical nature of the sludge, but also by the method of application. Since certain common methods of application could create significant adverse impacts on ecosystems, managers are advised to consult with appropriate technical experts to gain a better understanding of the implications of these considerations.

Certain species can be expected to be relatively advantaged or disadvantaged by the higher levels of soil macro and micro-nutrients and organic material resulting from sewage sludge application. They will out-compete, or be out-competed by, species better adapted to the new conditions.

Whether these changes are positive or adverse can only be evaluated in a programmatic context. If the land management objective is to re-vegetate a heavily mined or otherwise disturbed area, improve forage for livestock or wildlife, reseed after a floral pest removal, or accomplish some similar objective, then the changes are more likely to be considered positive. On the other hand, if the land management objective is to maintain the ecological *status quo*, or to enhance a population of a species that would be disadvantaged by sludge application, then the land manager may choose to reject the beneficial use proposal as not being consistent with the land management objectives.

4. *Water Quality Considerations.* Federal land and facility managers are responsible for controlling non-point source pollution that may arise from land disturbing activities or the use of materials such as fertilizer on Federal land.

Federal sludge regulations protect water quality under a wide range of conditions of sludge application. Applying properly treated sewage sludge to well vegetated sites and where tillage is a standard practice further minimizes the potential for adverse water quality impacts of such applications. Where such conditions or tillage practices are not typically the case, land managers should consider possible short term adverse water quality effects. For example, sludge application on undisturbed arid and semi-arid lands may need further research or pilot studies regarding suitable measures or practices to control possible contamination from flash floods and other high intensity storm events.

5. *Risk Assessment and Innovation.* Beneficial use of municipal sewage sludge has not previously been a common practice of Federal land management agencies. When it has occurred, it has typically been on the initiative of local managers. Adopting non-traditional practices always poses risks to some degree. However, failing to adopt a new practice may also pose risks if it precludes an opportunity to make progress toward fulfilling the agency's land management objectives. Consequently, the risk of foregoing possible land management benefits which may result from innovative land management practices, needs to be weighed against the risks associated with such practices.

V. Agency Implementation Guidance

Federal actions that involve the beneficial use of municipal sewage sludge on Federal lands must comply with National Environmental Policy Act (NEPA) review. Federal agencies will follow their own NEPA guidelines.

The following five factors illustrate the preferred analytical approach for Federal land management agencies to use in evaluating beneficial use proposals. This is not a prescribed process, but guidelines which agencies should seek to satisfy in substance. Each agency will use its own applicable internal procedures for evaluating beneficial use proposals; these procedures are expected to vary among agencies.

In evaluating beneficial use proposals, the Federal land management agency needs to:

—Determine whether adoption of the proposal would comply with applicable law and regulation, would be consistent with the agency's long-term land management objectives, and conforms to the agency's approved land management plans for the specific lands identified in the proposal.

—Determine whether the proposal's predicted effects, assuming it is successfully implemented as proposed, will actually promote the agency's resource management objectives (e.g.: silviculture, forage enhancement, and land reclamation).

—Assess the proposal based on existing credible scientific information. In the

absence of sufficient scientific information to make a reasonable decision, the agency will consider a pilot project designed to produce the necessary information to make an informed decision.

—Determine whether the anticipated costs to the agency of implementing the proposal appear justifiable when compared to the anticipated natural resource management benefits that would result from the adoption of the proposal. In evaluating a beneficial use proposal, Federal land managers should consider any information provided by the applicant (or otherwise obtained) concerning: (1) The applicant's opportunity cost (relative to the next best sewage sludge management option reasonably available to the applicant) should the proposal be rejected, (2) modifications to the original proposal that could further enhance the beneficial use aspects or control any adverse effects of the project as originally proposed, and (3) ways to reduce the agency's costs, such as, cost reimbursement and applicant auditing or monitoring of the project.

—Recognize that, as the land manager, the agency may have an important role in developing permits issued by States or the Environmental Protection Agency which govern the use of sludge, whether or not the agency is a signatory to the permit. In this capacity, Federal land managers may help to develop permit conditions which (1) provide needed management information, through activities such as sludge sampling and site monitoring, (2) determine the rate, frequency, timing, and method of sludge application, (3) incorporate appropriate best management practices to control non-point source pollution of surface waters that might otherwise result from surface runoff during storm events, and (4) provide for any necessary safety practices during the actual application of sludge.

VI. Judicial Review

This statement is intended only to provide policy guidance to agencies in the exercise of their discretion concerning the management of Federal lands. This statement is not intended to create any right or benefit, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers or any person. Thus, this statement is not intended to create any substantive or procedural basis on which to challenge any agency action or inaction on the ground that such action or inaction was not in accordance with this statement.

[FR Doc. 91-16999 Filed 7-17-91; 8:45 am]
BILLING CODE 1505-01-M

Attachment 2

Foreword of Comments from "Peer Review
Standards for the Disposal of Sewage Sludge
U.S. EPA Proposed Rule 40 CFR Parts 257 and 503
(February 6, 1989 Federal Register pp. 5746-5902)
Organized by Cooperative State Research Service
Technical Committee W-170."

FOREWORD

The U. S. Environmental Protection Agency (EPA), under authority of sections 405 (d) and (e) of the Clean Water Act (CWA) as amended (33 U.S.C.A. 1251, *et seq.*), proposed regulations to protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants which may be present in sewage sludge. The proposed rules (40 CFR Parts 257 and 503, Standards for the Disposal of Sewage Sludge. Federal Register Vol. 54, No. 23 p 5746 - 5902) were published Monday February 6, 1989. They include standards for the final use or disposal of sewage sludge applied to agricultural and non-agricultural land, distributed and marketed, placed in monofills or surface disposal sites, or incinerated. In the proposed rules the Agency asks the U.S. Department of Agriculture (USDA) Cooperative States Research Service (CSRS), Regional Research Technical Committee (W-170) to review the scientific and technical bases of the proposed rule during the comment period. In response, W-170 formed a Peer Review Committee (PRC) with Drs. A. L. Page and T. J. Logan as Co-Chairs. The PRC, composed of 35 recognized experts from academia, government and private industry, met in Washington, DC from April 12 to April 15. They met in assigned workgroups (Monofills/Surface Disposal/ Nonagricultural Land Application, Agricultural Land Application, Distribution and Marketing, and Risk Assessment). Each workgroup was responsible for review and preparation of preliminary drafts of their particular area. During the meeting the whole PRC met numerous times to discuss progress and identify common areas. After the meeting, each workgroup reviewed and edited their section, and then the entire document was reviewed and edited by each of the PRC members. The Co-Chairs and Chairman of each Workgroup met July 8 to July 12, 1989 to revise and edit the complete draft report.

W-170

The W-170 committee and its predecessors, W-124 and NC-118, are CSRS committees formulated for the purpose of conducting regional research. Research projects must be regional in scope and are developed by researchers from land grant universities, agricultural experiment stations, and USDA laboratories within four regions throughout the United States (North East, North Central, Southern, and Western). Project approval involves preparation of a proposal, approval at the local, regional, and national levels. Funds for regional research are allocated under the provisions of the Hatch and MacIntire & Stennis Acts and each participating unit receives funds based upon a formula.

History

Regional research on land application of municipal sewage sludge was initiated in the North Central and Western regions in 1972. Chronology leading to formation of the W-170 committee follows:

-1972 NC-118 Project, "Utilization and Disposal of Municipal, Industrial and Agricultural Processing Waste on Land", and W-124 Project, "Soil as a Waste Treatment System", were approved for a 5-year duration. The projects involved researchers from Land Grant Universities, USDA laboratories, and EPA.

-1977 Recognizing the similarity of interests and objectives between NC-118 and W-124, a national project was proposed that combined researchers from both projects and focused exclusively on land application of municipal sewage sludge. The project, designated W-124 and entitled "Optimum Utilization of Sewage Sludge on Land", was approved for a 5-year duration. The project involved 44 researchers from 15 Land Grant Universities, 3 USDA laboratories, 1 EPA laboratory, 2 municipal wastewater treatment agencies, and TVA.

-1982 A two year extension of W-124 was requested and approved.

-1984 Recognizing the continued need for national research on waste utilization on land, researchers within W-124 developed and submitted a new national project entitled "Chemistry and Bioavailability of Waste Constituents in Soils". The project was approved for a 5 year duration and designated W-170. The project involved 25 researchers from 13 Land Grant Universities, 2 USDA laboratories, 1 municipal wastewater treatment agency, 1 EPA laboratory, and TVA.

Involvement

In addition to the regional research projects, W-170 and its predecessor committees have been directly involved in a number of other activities dealing with land application of municipal sewage sludge:

-1973 Organized and conducted with EPA, the Joint Conference on Recycling of Municipal Sludges and Effluents on Land, held at the University of Illinois. Publication of the proceedings of this early conference provided the stimulus for an extensive program of research conducted by federal, state, municipal, and private agencies.

-1975 Published North Central Regional Research Bulletin No. 170, "Sampling and Analysis of Soils, Plants, Waste Waters, and Sludge: Suggested Standardization and Methodology". R. Ellis, J. J. Hanway, G. Holmgren, and D. R. Keeney, eds. Agr. Exp. Sta., Kansas State Univ.

-1976 Published North Central Regional Research Pub. No. 235, "Application of Sludges and Wastewaters on Agricultural Land: A Planning and Educational Guide". B. D. Knezek and R. H. Miller, eds. OARDC, Wooster, OH.

-1977 Published North Central Regional Extension Pub. No. 52, "Utilizing Municipal Sewage Wastewaters and Sludges on Land for Agricultural Production". 1977. L. W. Jacobs, ed. Coop. Ext. Serv., Michigan State Univ.

-1979 At request of EPA, reviewed "U.S. EPA Criteria of Solid Waste Disposal Facilities - Proposed Classification Criteria", Federal Register, Feb. 6, 1979. Report submitted March 31, 1979.

-1979 At request of EPA, reviewed "Interim Final Criteria", Federal Register, September 13, 1979. Report submitted January 25, 1980.

-1983 Organized and conducted a workshop on "Utilization of Municipal Wastewater and Sludge on Land". This workshop was co-sponsored by EPA, USDA, CSRS, the University of California Kearney Foundation of Soil Science, the U.S. Army Corps of Engineers, and the National Science Foundation.

-1985 Organized and conducted a workshop on "Land Application of Municipal Sewage Sludge". The purpose of the workshop was to bring together researchers involved in land application of sewage sludge to evaluate and summarize their most recent data. In light of this information, the workshop assessed the validity of assumptions made in the risk assessment process on fate of sludge contaminants. Findings of the workshop are contained in a book entitled "Land Application of Municipal Sewage Sludge", edited by A. L. Page, T. J. Logan, and J. A. Ryan, and published by Lewis Publishers, Inc., Chelsea, MI.

In addition to direct involvement in land application of sludge research, members of the W-170 committee have participated in sludge related activities sponsored by other agencies. Examples follow:

-1976 CAST (Council for Agricultural Science and Technology) workshop, "Application of Sewage Sludge to Cropland: Appraisal of Potential Hazards of Heavy Metals to Plants and Animals". CAST Rep. No. 64.

-1980 CAST workshop, "Effects of Sewage Sludge on Cd and Zn Content of Crops". CAST Rep. No. 83.

-1987 EPA Science Advisory Board. Review of Technical Documents. Supporting Proposed Revisions to EPA Regulations for the Disposal/Reuse of Sewage Sludge under Sec. 405(d) of the Clean Water Act.

-1988 Contributing authors and technical reviewers of "U.S. EPA Guidance for Writing Case-by-Case Permit Requirements for Municipal Sewage Sludge". Draft, September 1988.

PEER REVIEW PARTICIPANTS

Part 503 Regulations for Land Application, Distribution and Marketing, Monofills, and Surface Disposal

Name	Affiliation	Expertise
Dr. Dale Baker	Pennsylvania State U. Dept. of Agronomy	Metal Bioavailability
Dr. Ken Barbarick	Colorado State Agronomy Dept.	Metal Bioavailability, Utilization of Sludge N
Dr. Robert Bastian	EPA	Sludge Processing and Management Practices, Regulatory Impacts
Ms. Susan Brett	Environ Corp.	Risk Assessment
Dr. Herman Cember	Northwestern U. Technical Institute	Environmental Toxicology, Risk Assessment
Dr. Rufus Chaney	USDA-ARS	Metal Bioavailability
Dr. Andrew Chang	U. of California-Riverside, Dept. Soil and Environ. Sci.	Metal Bioavailability
Dr. Willard Chappell(a)	U. of Colorado-Denver Cntr. Environ. Sci.	Risk Assessment
Dr. Richard Corey	U. Wisconsin Dept. Soil Sci.	Metal Bioavailability
Dr. Robert Dowdy	USDA-ARS	Metal Bioavailability
Dr. Joseph Farrell	EPA	Sludge Processing Sludge Pathogens
Dr. Richard Finno	Northwestern U. Technical Institute	Hydrological Modeling and Geotechnical Engineering
Dr. Paul Fitzgerald	U. of Illinois (Retired)	Metal Bioavailability, Animal Toxicology, Pathogens
Dr. Charles Frink	Connecticut Agric. Exp. Sta.	Organic Bioavailability
Dr. Lawrence Gratt	IWG Corporation	Risk Assessment

Name	Affiliation	Expertise
Dr. Robert Griffin	Ill. State Geol. Survey	Geochemical and Hydrological Modeling
Dr. Paul Hammond	U. of Cincinnati Med. Ctr., Dept. of Environ. Health	Environmental Toxicology, Risk Assessment
Dr. Charles Henry	U. of Washington College of Forestry Resources	Sludge Application to Forested Land
Dr. Tom Hinesly	U. of Illinois Dept. of Agronomy	Metal Bioavailability
Dr. Cecil Lue-Hing	Metro. Water Rclmtn. Distr. of Greater Chicago	Sludge Processing, Metal Bioavailability, Management Practices
Dr. Robert Horvath	County San. District of Los Angeles	Sludge Processing Sludge Pathogens
Dr. Lee Jacobs(a)	Michigan State U. Dept. of Crop and Soil Sci.	Metal Bioavailability Utilization of Sludge N
Dr. Terry Logan(b)	The Ohio State U. Dept. of Agronomy	Metal Bioavailability
Dr. George O'Connor (a)	New Mexico State U. Dept. of Agronomy	Organic Bioavailability, Metal Bioavailability
Dr. Michael Overcash (a)	North Carolina State U., Dept. of Chem. Engineering	Geochemical Modeling, Organic Bioavailability
Dr. Al Page (b)	U. of California-Riverside, Dept. Soil and Environ. Sci.	Metal Bioavailability
Dr. James Ryan	EPA	Metal Bioavability, Organic Bioavailability
Dr. Ali Tabatabai	Iowa State U. Dept. of Agronomy	Metal Bioavailability, Utilization of Sludge N
Mr. David Taylor	Madison Metro Sewerage Distr., Madison, WI	Metal Bioavailability, Utilization of Sludge N, Management Practices

Name	Affiliation	Expertise
Dr. Curtis Travis(c)	Oak Ridge National Lab. Off. of Risk Analysis	Risk Assessment
Dr. John Walker	EPA	Sludge Processing and Management Practices, Metal Bioavailability
Dr. Jerry Weber	North Carolina State U., Dept. of Crop Science	Organic Bioavailability
Mr. James Werner	National Resources Defense Council	Interpretation of Federal Environmental Policy
Dr. George Woods	U. of Illinois (Retired)	Animal Toxicology, Pathogens
Dr. David Zenz	Metro. Water Rclmntn. Distr. of Greater Chicago	Sludge Processing, Metal Bioavailability, Management Practices

(a) workgroup chair
(b) committee co-chair
(c) reviewed PRC report, did not attend PRC meeting

Attachment 3

Excerpt from Wisconsin Department of Natural Resources Permit Issued to Madison Metropolitan Sewerage District Pertaining to Application of Sludge to Agricultural Land

SPECIAL REPORT REQUIREMENTS

A. COMPLIANCE MAINTENANCE ANNUAL REPORTS

Compliance Maintenance Annual Reports (CMAR) shall be completed on information obtained over each calendar year regarding the wastewater treatment and conveyance system. The CMAR shall be submitted by the permittee on or before March 31 of each year on a report form provided by the Department. The CMAR shall be completed and signed by a duly authorized representative. In the case of a publicly owned treatment works a resolution from the municipality's governing body shall accompany the CMAR.

B. SLUDGE MANAGEMENT

All sludge management activities shall be conducted in compliance with the Municipal Sludge Management Code, Wis. Adm. Code NR 204. Sludge may not be applied to lands without an approval letter or Agricultural Site Evaluation Form 3400-122. All conditions attached to the approval letter or form must be complied with pursuant to NR 204.07(1)(a)(b) for land application. A violation of NR 204 or the standard or special conditions of approval constitutes a violation of this permit.

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility. If the facility is in Wisconsin it must be licensed under NR 500-520.

Sludge management report forms shall be completed and submitted for the disposal/recycling of solids, sludges or other materials resulting from treatment of wastewater.

The sludge management information shall be submitted on forms approved by the Department, and shall consist of the following (as applicable): (1) General Sludge Management Information Form, (2) Sludge Characteristics Report Form, (3) Agricultural Site Characteristics and Operations Form, (4) Sludge Disposal Land Application Report Form, and/or (5) Sludge Landfilling/Other Disposal Report.

1. GENERAL SLUDGE MANAGEMENT INFORMATION FORM

The General Sludge Management Information Form #3400-48 shall be submitted by January 31st of even numbered years. The form must also be updated and submitted prior to any significant sludge management changes. Significant sludge management changes include but are not limited to: sending sludge to another POTW for disposal, a significant addition of actual flow, a significant change in sludge storage capacity and use of a new disposal/recycling method.

2. SLUDGE CHARACTERISTIC REPORT

a. For Sludge #01, anaerobically digested liquid requirements.

SPECIAL REPORT REQUIREMENTS

B. SLUDGE MANAGEMENT (con't)

The sludge shall be analyzed during each bi-monthly period listed below and a Sludge Characteristics Report Form #3400-49 shall be filed for each analysis. Reports shall be filed within thirty days following the end of each bi-monthly period.

First Bimonthly Period	February 28
Second Bimonthly Period	April 30
Third Bimonthly Period	June 30
Fourth Bimonthly Period	August 31
Fifth Bimonthly Period	October 31
Sixth Bimonthly Perios	December 31

The physical, chemical and biological analysis shall include Lists 1, 2, and 3 for the February 28 sample and Lists 2 and 3 for the remaining sampling events.

List 1

Priority Pollutant Scan

List 2

Parameter*	Abbreviation	Units
Total Solids**	TS	%
Total Kjeldahl Nitrogen	TKN	%
Ammonium Nitrogen	NH_4-N	%
pH		Standard Units
Total Phosphorus	P	%
Total Potassium	K	%
Arsenic	As	mg/kg
Cadmium	Cd	mg/kg
Copper	Cu	mg/kg
Chromium	Cr	mg/kg
Lead	Pb	mg/kg
Molybdenum	Mo	mg/kg
Mercury	Hg	mg/kg
Nickel	Ni	mg/kg
Selenium	Se	mg/kg
Zinc	Zn	mg/kg
Total Polychlorinated Biphenyls	PCB's	mg/kg

SPECIAL REPORT REQUIREMENTS

B. SLUDGE MANAGEMENT (con't)

List 3

Parameter*	Units	Parameter*	Units
Aldrin/Dieldrin	mg/kg	Hexachlorobutadiene	mg/kg
Benzene	mg/kg	Lindane	mg/kg
Benzidine	mg/kg	Malathion	mg/kg
Benzo (a) anthracene	mg/kg	Pentachlorophenol	mg/kg
Benzo (a) pyrene	mg/kg	Phenanthrene	mg/kg
Bis (2-ethylhexyl) phthalate	mg/kg	Phenol	mg/kg
Carbon tetrachloride	mg/kg	Tetrachloroethylene	mg/kg
Chlordane	mg/kg	Toxaphene	mg/kg
Chloroform	mg/kg	Trichloroethylene	mg/kg
Cyanide (total)	mg/kg	2,4,6-Trichlorophenol	mg/kg
DDT/DDE/DDD	mg/kg	Vinyl chloride	mg/kg
3,3'-Dichlorobenzidine	mg/kg	Volatile Suspended Solids Reduction***	%
Dichloromethane	mg/kg	Pathogen Reduction*** (measured below)	
2,4-Dichlorophenoxy acetic acid	mg/kg	(1) Fecal coliform (indicator organism)	MPN/100 ml and log reduction
Dimethyl nitrosamine	mg/kg		
Endrin	mg/kg		
Heptachlor	mg/kg	(2) Salmonella (actual)	MPN/100 ml and log reduction
Hexachlorobenzene	mg/kg		

* All parameters other than percent solids and pH shall be calculated on a dry weight basis.
** Total solids shall also be determined for influent sludge to the pathogen reduction process whenever list 3 is required.
*** Reported for each parameter at each of two sampling points (before process to reduce pathogens and at the point the sludge is discharged from the plant for disposal).

The parameters which require reporting may be reduced on a case-by-case basis depending on the volume of sludge produced and the concentrations of the parameters listed above based on at least two years of reports.

The permit may be modified to require analysis of additional parameters depending on pollutant levels in the reports, changes or additions of industrial discharges to the sewer system or due to changes in the Administrative Code or Section 405(d) of the Clean Water Act. This permit may be reopened to include limits on sludge constituents if warranted based on review of the monitoring data or due to changes in state and/or federal requirements.

b. For Sludge #02, anaerobically digested, lagooned liquid requirements.

The sludge shall be analyzed on a quarterly basis and a Sludge Characteristics Report Form #3400-49 shall be filed for each analysis. Reports shall be filed in accordance with the following annual schedule:

First Quarter Report	March 31
Second Quarter Report	June 30
Third Quarter Report	September 30
Fourth Quarter Report	December 31

The physical, chemical and biological analysis of the sludge shall include List 2 for all sampling events.

List 2

Parameter*	Abbreviation	Units
Total Solids**	TS	%
Total Kjeldahl Nitrogen	TKN	%
Ammonium Nitrogen	NH_4-N	%
pH		Standard Units
Total Phosphorus	P	%

SPECIAL REPORT REQUIREMENTS

B. SLUDGE MANAGEMENT (con't)

Total Potassium	K	%
Arsenic	As	mg/kg
Cadmium	Cd	mg/kg
Copper	Cu	mg/kg
Chromium	Cr	mg/kg
Lead	Pb	mg/kg
Molybdenum	Mo	mg/kg
Mercury	Hg	mg/kg
Nickel	Ni	mg/kg
Selenium	Se	mg/kg
Zinc	Zn	mg/kg
Total Polychlorinated Biphenyls	PCB's	mg/kg

* All parameters other than percent solids and pH shall be calculated on a dry weight basis.

c. For Sludge #03, anaerobically digested cake requirements.

The sludge shall be analyzed on a quarterly basis and a Sludge Characteristics Report Form #3400-49 shall be filed for each analysis. Reports shall be filed in accordance with the following annual schedule:

First Quarter Report	March 31
Second Quarter Report	June 30
Third Quarter Report	September 30
Fourth Quarter Report	December 31

The physical and chemical analysis of the sludge shall include List 2 for all sampling events.

List 2

Parameter*	Abbreviation	Units
Total Solids**	TS	%
Total Kjeldahl Nitrogen	TKN	%
Ammonium Nitrogen	NH_4-N	%
pH		Standard Units
Total Phosphorus	P	%
Total Potassium	K	%
Arsenic	As	mg/kg
Cadmium	Cd	mg/kg
Copper	Cu	mg/kg
Chromium	Cr	mg/kg
Lead	Pb	mg/kg
Molybdenum	Mo	mg/kg
Mercury	Hg	mg/kg
Nickel	Ni	mg/kg
Selenium	Se	mg/kg
Zinc	Zn	mg/kg
Total Polychlorinated Biphenyls	PCB's	mg/kg

* All parameters other than percent solids and pH shall be calculated on a dry weight basis.

SPECIAL REPORT REQUIREMENTS

3. SLUDGE MANAGEMENT (con't)

I. SLUDGE DISPOSAL/RECYCLING SITE REPORTS

Activities involving the transportation, recycling or disposal of sludge shall be recorded in a logbook. The logbook shall be maintained on a daily basis when sludge activities are underway. The logbook shall, at a minimu, contain the following information:

- Location of disposal, storage, or recycling site;
- Type of sludge activity;
- Type of sludge;
- Amount of sludge; and
- Date.

The records shall be kept on file for five years and shall be available for inspection by Department representatives.

a. AGRICULTURAL SITE CHARACTERISTICS AND OPERATIONS FORM/RECYCLING BY LAND APPLICATION

An Agricultural Site Characteristics and Operations Report (Form #3400-53) shall be submitted to the Department for review. The Department will evaluate the proposed landspreading field and issue an approval document (i.e., Agricultural Site Evaluation Form For Land Application, Form #3400-122). This document must be obtained prior to using any field for landspreading sludge.

If sludge will be recycled to the land (other than at licensed landfill sites), the following information shall be provided for each recycling site.

1) Soil test results (see NR 204.06(4)(c)) shall be completed at least once every three years for each active recycling site/field.

2) The location of the field shall be indicated on a USDA soil survey map. Either a plat map or a USGS topographic map or aerial photograph shall also be provided. The proposed field shall be outlined on all maps.

3) A description of the crops to be grown or the dominant vegetation on the recycling field.

4) A description of adjacent land use, drainage and land features associated with the recycling field.

5) The ownership of the field.

6) A copy of any land use agreement.

7) Name of the applicator of the sludge, such as the farmer, landowner, municipality, contractor or others.

8) An estimate of the total acreage to which sludge will be applied.

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SPECIAL REPORT REQUIREMENTS

B. SLUDGE MANAGEMENT (con't)

b. DISPOSAL AT LICENSED LANDFILL

If sludge will be disposed of at licensed landfills, the following information shall be provided:

1) The amount of sludge to be disposed of at each landfill.

2) The landfill name(s) and license number(s).

3) Contractual agreements.

4) Approval from this Departments Bureau of Solid Waste Management or if disposal is out of state an approval from that states regulator agency shall be provided.

c. DISPOSAL BY PUBLIC DISTRIBUTION OR MARKETING

The Department shall be notified prior to disposal of sludge by use of Public Distribution or Marketing. If sludge will be disposed/recycled of by means of Public Distribution or Marketing, the following information shall be provided: (For information pertaining to this disposal option, consult NR 204.08.)

1) Means of public distribution.

2) Written instructions for proper sludge use and needed safety precautions.

3) Availability of the sludge.

4) Records of sludge pick up and use.

4. SLUDGE DISPOSAL/RECYCLING RECORDS

You must report all disposal and/or recycling of sludge. Information reports shall be submitted by JANUARY 31, ANNUALLY.

a. SLUDGE LAND APPLICATION REPORT FORM

Information regarding sludge applied to agricultural and forest crop lands shall be submitted on a Sludge Disposal - Land Application Report (Form 3400-55) and include the following:

1) Fields on which sludge was spread.

2) Number of acres sludge was applied to.

3) Amount of sludge applied.

4) Crop grown after sludge was applied.

5) Method of sludge application.

TESTIMONY OF RICHARD D. KUCHENRITHER, P.E.
ON BEHALF OF THE WATER ENVIRONMENT FEDERATION
BEFORE THE HOUSE AGRICULTURE COMMITTEE
SUBCOMMITTEE ON CONSERVATION, CREDIT, AND RURAL DEVELOPMENT

Mr. Chairman and members of the subcommittee, my name is Dick Kuchenrither. I am Director of Residuals Management for Black & Veatch Consulting Engineers headquartered in Kansas City, Missouri, and the past chairman of the Residuals Management Committee of the Water Environment Federation (WEF).

I am here today on behalf of the Water Environment Federation, a not-for-profit technical, educational, and professional organization devoted to providing leadership and guidance in the preservation and enhancement of water quality and water resources. Founded in 1928, our 38,000 members include engineers, scientists, regulators, wastewater treatment plant operators and managers, and others working in state and local government, Federal agencies, academia, industry, and private practice.

Within the context of my job for Black & Veatch, I have been responsible for planning and helping to implement sludge management programs for major municipalities across the United States, including Boston, New York, Philadelphia, Minneapolis-St. Paul, Denver, and Los Angeles. This experience over the past 15 years provides me with a unique perspective on the benefits

which can be realized from the use of wastewater treatment sludge, as well as the problems faced in developing programs to derive these benefits. I am pleased today to have the opportunity to appear before this subcommittee and provide WEF's comments on HR 4360.

INTRODUCTION

First of all, it is important for the subcommittee to recognize that agricultural land application of treated sludge has been, and continues to be, successfully used by many in the agricultural community. The economic, agronomic, and environmental benefits which farmers have realized through the use of sludge on their lands in lieu of chemical fertilizers have been extensive.

Second, the subcommittee should be aware of the key role that the Soil Conservation Service, and the agricultural extension agent system, has played in helping to develop many of the successful long-term agricultural land application programs with which I have been associated. Those of us who are involved with agricultural use of sludge on a daily basis are indebted to them.

SCS and extension agents with whom I have worked enthusiastically endorse the use of sludge as a fertilizer. In fact, their endorsements have helped overcome the initial reluctance of many farmers and their neighbors to use sludge. In virtually all

cases with which I have been associated, the farmers themselves become enthusiastic supporters of sludge utilization programs after one or two crops. These farmers have realized long-term benefits from the improvement of soil fertility and the lessening of soil erosion.

Although the goal of HR 4360 to promote safe beneficial use is commendable, the bill as presently proposed may actually make it more difficult for many farmers in the United States to use and benefit from wastewater treatment plant sludge. In its present form, this bill ultimately could make beneficial use more difficult through an unwarranted increase in public concern and a decrease in public acceptance.

EXISTING REGULATORY SITUATION

The most important part of any sludge utilization program is agreement by the local community that this practice is beneficial. Public acceptance of agricultural sludge utilization includes assuring farmers, and their neighbors who may or may not be engaged in farming, that the application of sludge on farm land will not adversely affect their health, crops, animals or land.

A strong regulatory program is of paramount importance to public acceptance. Regulations must be protective of farmers, their land, crops, and neighbors, while allowing them to realize the

benefits associated with sludge utilization. In its present form, HR 4360 would create a redundant layer of regulatory requirements that ultimately would diminish public acceptance and make the beneficial use of sludge more difficult.

EPA is in the final stages of developing comprehensive risk-based sludge management regulations. These regulations, which are expected to be promulgated later this year, will strictly govern the use of wastewater treatment plant sludge on agricultural land, as well as other use and disposal options. These comprehensive regulations have been under development for over ten years, and have been the subject of extensive industry and scientific peer review, including extensive input from the U.S. Department of Agriculture.

While we have not seen the final regulations, which have been developed using a detailed risk pathway approach, we believe they will be more than adequate to protect human health and the environment, including farmers' crops, animals and land. These new regulations will further ensure the safety sludge and build public confidence in beneficial use programs.

Although comprehensive Federal regulations dealing with wastewater treatment plant sludge are still a few months from being promulgated, every state already regulates sludge in some fashion. While specific regulations vary from state to state,

they have been effective in ensuring the safe beneficial use of sludge on agricultural land. This is evidenced by the fact that some form of land application or beneficial use of sludge has been practiced in every state, and there have been no documented incidences of adverse human health or environmental impacts when sludge regulations have been followed.

ENVIRONMENTALLY SOUND SLUDGE AND APPLICATION PRACTICES

Presently there are more than 2,000 wastewater treatment plants producing more than 2.3 million dry metric tons per year of beneficially usable sludge for land application programs. This represents approximately 42 percent of the sludge generated annually in the United States. Agricultural land application represents the most prominent form of sludge utilization for such states as Oklahoma, Iowa, Illinois, Kansas, Nebraska, Texas, and Indiana.

A number of public agencies have been practicing land application for years. These include the Metropolitan Chicago Water Reclamation District (20 years); Springfield, Illinois (19 years); Manhattan, Kansas, (15 years); Madison, Wisconsin (13 years); Omaha, Nebraska, Fort Collins, Colorado, and Los Virgines, California (all with 10 years or more).

At the present time, there are many municipalities that rely upon the interstate transport of sludge as a key component of their

beneficial use programs. These cities include Los Angeles; Charlotte, North Carolina; Philadelphia; and Milwaukee. Milwaukee's dried sludge product is, in fact, used in all 50 states. Approximately 31,000 dry tons per year of this product are transported across state lines, and more than 5,000 tons are utilized in the midwest region of the United States. This program has operated successfully for more than 60 years.

Sludge quality also is improving. Over the past ten years the amounts of metals and synthetic organic compounds in our wastewater treatment plant sludges have decreased dramatically. This is due primarily to the industrial pretreatment programs that EPA has required wastewater treatment plants to implement. Cities such as Los Angeles, Boston, and Philadelphia have all seen dramatic decreases in metals concentrations.

This trend also is reflected in the results of EPA's 1990 National Sewage Sludge Survey. This survey analyzed sludge from 209 randomly-selected wastewater treatment plants across the country for a variety of metals and organic compounds. When the results of the National Sewage Sludge Survey are compared with the results of EPA's "40 City Study" (a similar study completed approximately 10 years earlier), dramatic decreases in metals such as cadmium, lead, and nickel are evident. Further, detection of synthetic organic compounds under the 1990 study was so infrequent, and at such low levels, that EPA now is

considering dropping the monitoring requirements for organic compounds in wastewater treatment plant sludges.

Sludge quality has improved so greatly that EPA also is considering the adoption of alternative pollutant limits for sludge. This would allow sludges that meet conservative and stringent numerical limitations for specific pollutants to be utilized with a minimum of monitoring and recordkeeping. Much of the sludge produced today in the United States would qualify for use under an alternate pollutant level regime.

PUBLIC ACCEPTANCE

The dramatic improvement in sludge quality has been a primary reason for increased public acceptance of land application and other beneficial uses of sludge.

HR 4360 could potentially have a negative impact on public acceptance of sludge use. As stated previously, public acceptance plays a key role in a farmer's ability to beneficially utilize sludge on his land. Whenever new regulatory actions are taken, however, it tends to raise concerns among the public. They believe they are not adequately protected by existing regulations. Yet under the soon-to-be released comprehensive Federal regulations and existing state regulations, sludge is a highly regulated commodity. Thus, there is no valid reason for imposing further regulations. A new regulatory regime

at this point would serve only to raise public anxiety, and may prevent the farming community from realizing the benefits associated with the agricultural utilization of wastewater sludge.

Identifying sludge which is transported across state lines as a threat could create a significant public acceptance problem even for those agencies which distribute their sludge solely in-state. The distinction between in-state and out-of-state sludges will be lost on the public, who tend to view all sludges alike. In addition, restricting the use of out-of-state sludge may in fact create a false sense of security in that a sludge which originates in-state is, by definition, of higher quality, which may not be the case.

CONCLUSIONS

In conclusion, we believe the regulatory regime outlined in HR 4360 is unnecessary for ensuring the environmental soundness of sludge for agricultural land application, and would be counterproductive in gaining public support for using this valuable resource.

We support the need to conduct ongoing research on ways to improve or expand upon the beneficial use options for sludge in the agricultural arena. The WEF Research Foundation, a nonprofit research organization affiliated with the Water Environment

Federation, already is investigating ways to expand these research efforts.

The Water Environment Federation would like to work with this subcommittee and USDA to further expand our public education efforts through the existing agricultural network. This will contribute to broader understanding of the benefits for farmers associated with the use of wastewater sludge on agricultural land.

Thank you for allowing me to appear before you today. I would be happy to answer any questions you may have.

Oklahoma Wildlife Federation
State Affilate National Wildlife Federation
3900 N. SANTA FE AVE.
OKLAHOMA CITY, OKLA. 73118
(405) 524-7009

April 16, 1992

MAIL CODE: _____

APR 21 1992

REPORT [illegible]
STAFF: _____

The Honorable Glenn English
Chairman
U.S. House of Representatives
Subcommittee on Conservation, Credit
and Rural Development
Room 1301, Longworth House Office Building
Washington, DC 20515

Dear Representative English:

Thank you for your invitation to provide input from the Oklahoma Wildlife Federation on H.R. 4360 before your subcommittee. While the Federation was unable to send a representative to the actual hearing on April 2nd, we hope that the enclosed comments provide you with assistance in strengthening the bill, or in developing future guidelines for the relevant agencies.

The Federation supports the use of sludge that truly benefits the land, not the use of land to benefit sludge. It is essential to keep foremost in mind the role of American farmers and farmland in sustaining all Americans and the role of a clean environment and abundant wildlife in the ideal American way of life. The farmer is at a serious disadvantage in waste disposal issues, and the enclosed testimony is designed to provide some safeguards.

The comments provided were put together by a team of dedicated volunteers, led by Dr. John Woods of Thomas, Okla. Their hard work has led to many useful insights that I hope will benefit you in refining this legislation.

Again, thank you for the opportunity to provide this testimony. If you or your staff have any further questions concerning the enclosure, I would encourage you to call Dr. Woods at (405) 774-3038 or (405) 661-3040.

Sincerely,

Don W Cox

Don W. Cox
President

cc: OWF Board of Directors

(Attachment follows:)

Comments of the Oklahoma Wildlife Federation
on H.R. 4360
"Soil Conservation and Domestic Allotment Act Amendments of 1992"

The Oklahoma Wildlife Federation appreciates Representative Glenn English's bill and its general thrust to involve the U.S. Department of Agriculture and the Soil Conservation Service as additional regulators, monitors, and decision makers in the matter of land application of sewage sludge.

The Federation supports the use of sludge that truly benefits the land, not the use of land to benefit sludge. It is essential to keep foremost in mind the role of American farmers and farmland in sustaining all Americans and the role of a clean environment and abundant wildlife in the ideal American way of life. The farmer is at a serious disadvantage in waste disposal issues.

Farming areas and their associated wildlife habitats seem to be targeted for waste disposal because of their sparse human populations and lack of resources to protect farming communities from the long predicted, and now evident, plans of metropolitan areas to unload their waste problems and risks on the farmers. H.R. 4360 can emphasize the close ties between farmland, wildlife, and our environment.

In particular, it seems reasonable to include in the bill's preamble a firm resolution to the effect that the USDA and its director, the SCS and its field staff, and associated research institutions implement this bill from a primary mission of enhancing the lot of farmers, improving farmland, and protecting our natural resources, as opposed to putting these at risk in order to help metropolitan areas solve their problems.

By making it easy for waste sources to dump their refuse, along with its related risks and liabilities on the farmers, we risk not only the welfare of our farmers and the environment, we enable waste sources to continue their polluting ways without true accountability and without realistic efforts to limit the quantity and harmful contents of their wastes.

The current form of the bill (as of March 19) is a great improvement over existing law. However, we believe that the following concerns should either be addressed as amendments to H.R. 4360, or as guidelines developed as a result of the bill:

Risk Analysis

1) The owner of a proposed land application site must be given a thorough written analysis on the benefits, risks, liabilities, and responsibilities (both short and long term) of sludge application to his land, and a clear indication of his rights in controlling the time, rate, and termination of application. Public notice of each proposed farm application site, with full legal description, must be published twice in each newspaper in the farm's home county. A full accounting of the source, tonnage, test results, and dates of application must be made a part of the permanent legal property abstract.

Currently in Oklahoma, it seems that sludge disposal firms are free to use propaganda to induce the farmer to allow land application, and there is no requirement for full disclosure of the true level of benefits and risks, no requirement for informed consent of the farmer, and no provisions for public records which would alert a future land buyer of potential liabilities.

2) Detailed plans and studies must be done to ensure protection of ground and surface water. Currently, it appears that the land application of sludge can be planned and carried out with no

attention to the location of aquifers, boreholes (other than known wells), and subsurface ground structure. Environmental Protection Agency booklets and other studies clearly indicate dangers of aquifer contamination.

3) Extensive research should be done to determine the long term effects which agricultural land application of sewage sludge has on the ecosystem, from the smallest beneficial micro-organism to the predators at the top of the food chain.

Most of the current research and regulations concentrate on a few of the heavy metals, and have little to say in terms of the overall effect of the myriad components of municipal sewage sludge.

4) Extensive research should be done in regards to each of the "risk" areas delineated by EPA in land application of sewage sludge. A panel of distinguished scientists with expertise in the specific areas of risk should be assembled, and aided by highly qualified statisticians, should analyze the available research, recommend application regulations and restrictions, and delineate and prioritize needed research projects.

Required Treatment

1) Source treatment must be adequate to ensure that viable pathogens are not introduced into the farm environment to an extent that humans, farm animals, or wildlife populations would be exposed to substantial risk.

2) Research must be done on the effects of long distance shipping and other delays in land applications of sewage sludge. Are there any pathogens which could regenerate beyond safe levels, particularly if the treated sludge is barely within guidelines when dispensed for shipment?

Current regulations specify the level of treatment required prior to shipment. Tests for pathogens are done immediately, or else the sample if refrigerated until testing. However, the actual sludge may sit in containers for weeks before application. Salmonella, for example, multiplies rapidly at room temperature.

3) Careful consideration should be given to all the possible components of sewage sludge and appropriate regulations should be developed for each component. In particular, contents such as salt, oil, grease, organic compounds, surfactants, nitrates, etc. should be studied and appropriate limits set.

Current research and regulations concentrate on heavy metals and their uptake by the plants. Other means and types of contamination don't get equal coverage.

4) The effect of dewatering should be studied, particularly in terms of its benefit or detriment to the farmer.

Dewatering appears to decrease the soil conditioning and fertilizing value of the sludge, while concentrating the pollutants that would be added to each acre of land.

5) The synergistic effects of the components of sewage sludge should be studied thoroughly.

It is well known that many chemical compounds have a much stronger impact together than separately.

Safe Application

1) Thorough research should be made into the most effective and beneficial manner of incorporating sludge into the soil.

More than 75% of the sludge can remain on the soil's surface when the sludge is applied according to accepted methods in some states (such as Oklahoma), leaving ample opportunity for pollution of air, water, and the ecosystem. Research should be conducted using the same incorporation methods as are allowed by regulation.

2) Research results and regulations of agricultural land application of sewage sludge shall be specific as to soil type, climate, wind conditions, ground and surface water formations, crop grown, and the general ecosystem of the test site.

Current EPA regulations list "grains" as one crop type and treat all grains the same. However, studies have shown that while small amounts of heavy metals accumulate into the corn grain, wheat tends to accumulate much more--up to the same level as the leafy part of the plant. Additionally, studies have shown high production of corn on sludge applied land, but studies have also shown a sharp decrease in production of wheat on sludge applied land.

The farmer deserves to know the effect that can be expected for his type of soil, climate, crop, and farming methods. The benefits and risks associated with land application of sewage sludge must be determined for each specific crop before sludge can be applied to land used to grow that crop.

3) When conflicting information is available from reputable research institutions, the research shall be deemed inconclusive, and agricultural land application of sewage sludge under the conditions studied shall be prohibited until the conflict is fully resolved.

Our land and water resources are too valuable to risk when reputable scientists maintain that current treatment methods and resulting contents of sludge render its safety for agricultural land application uncertain, or worse, almost certain to cause long term problems.

4) The data from some studies clearly indicate a significant detrimental effect of sludge application for certain crops and a significantly higher buildup of water polluting nitrates in cropland treated with sludge as opposed to commercial fertilizer. Refer to Colorado State University's study comparing the utility of sludge application to that of commercial fertilizer on dryland winter wheat. (TR91-5, June 1991) The average wheat production on sludge applied land (optimal application level--three dry tons per acre) was only 1/3 the production on commercial fertilized land (optimal application level--60 lbs per acre). The nitrate levels were 4 times as great in the sludge applied soil as in the commercially fertilized soil.

Wildlife and Natural Resources Protection

1) Regulations must be developed which protect the environment and wildlife and which specify appropriate penalties for harm to either.

Current regulations specify treatment and testing levels, and application procedures. There may be no significant regulation of effects on wildlife, the environment, or long term environmental impact.

2) Special restrictions should be formulated to protect migratory birds, endangered wildlife populations, and scenic areas.

Current regulations make no provisions for protecting wildlife and for preserving scenic areas.

3) Research should be done on the short and long term effects of land application of sewage sludge on the use of said land for recreation, hunting, fishing, and observing wildlife. The loss of use of the land for any of these purposes for any appreciable time shall be considered a cost and must be included in the cost/benefit analysis in determining the suitability of a site for sludge application.

Insurance/Liability

1) The sludge source and/or sludge handler must post bond or purchase insurance (within the target state) sufficient to protect the farmer from all sludge related losses and liabilities incurred for a period of at least 20 years.

The sludge source and sludge handlers reap large immediate benefits. They pay farmers nothing to apply sludge of questionable value and leave the farmers with most of the risks and liabilities.

2) The sludge source and the sludge handler must provide proof of their separate and joint capability and contractual commitment to adequately mitigate any harmful effects of the land applied sludge for the life of potentially harmful sludge ingredients.

Why should farmers bear the risks? What protects them once they put the sludge on their land based on their trust in the EPA?, the USDA?, the sludge handler?

Market Research

3) The USDA should research the possible detrimental effects of land application of sewage sludge on the marketability of crops known to be grown on "sludge land".

Consider the "Alar" apple scare and the "Chilean Fruit" panic. Many farmers can be ruined financially in a short time due to consumer concerns about a crop, whether or not the concerns are well founded. The wide variety of sludge contents certainly offers opportunity for consumer concern at any time.

Research Analysis

1) Regulations must be extensive and strict enough to ensure thorough, objective, and reliable monitoring of the sludge treatment, content, application, and its effect on the soil, water, air, and ecosystem at each application site.

Typically, sludge application plans target a particular community and include all local soil types. However, suitability may vary significantly within one farm.

2) Analysis of research results must be specific and not watered down by averaging over wide geographical areas, general sludge sources, soil types, crop categories, etc.

Some research averages the effects over entire states, or even the entire United States! The impact on a particular farm, the farmer, and those consuming his crops needs to be delineated.

3) The use of the "geometric average" in reporting sludge content data shall be considered conclusive evidence that the sludge source and/or sludge handler is aware of and intentionally hiding the fact that the sludge often fails to meet content regulations and restrictions. The handler applying such sludge shall be held in violation of ____ (line 16-24 page 7 of H.R. 4360) for each batch of sludge and each application site for which the sludge content data is included in a report using the "geometric average".

All reports of sludge content data shall include information on each regulated contaminant. The report shall include the raw data on tests of each batch of sludge and a summary showing the range of test values attained and a separate rectangular coordinate plot of the all the test values for each contaminant.

Some sludge sources and handlers have resorted to use of the "geometric average" to report sludge data, since it "smooths out" the variations in sludge. However, it is those variations which

should be addressed by regulations! One batch of hazardous waste mixed with several batches of normal waste looks pretty good when reported with a geometric average. With the geometric average, the average of "one" and "one hundred" is "ten", while the arithmetic average is "fifty". The range is "one" to "one hundred". The range is the most meaningful summary when content amounts are of concern.

4) Comparisons between pollution on land receiving sludge and land receiving commercial fertilizer shall be done in terms of the total amount of pollutant applied per acre per year, and not in terms of parts per million in the material applied. Also, comparisons shall be in terms of actual farming practices, and shall not compare sludge to items such as pesticides unless the application of the sludge significantly reduces the amount of pesticide applied. One area worth research is whether the application of sludge increases or decreases the need for pesticides and herbicides, and whether sludge decreases or increases the nitrate concentration in the soil.

In one recent comparison, the comparison was misleading in three ways: 1) it compared sludge with fertilizer quite different in composition than that normally applied on the farms in question, 2) it inaccurately generalized the comparison for one heavy metal to many heavy metals, and 3) it compared only parts per million in the source material, totally ignoring the overwhelming effect of the application of tons of sludge compared to pounds of commercial fertilizer.

Right-To-Know

1) The principal of "informed consent" shall be promoted and protected. The minimum fine for each instance of substantial misrepresentation in persuading a farmer or community to allow land application of sewage sludge shall be not less than _____ per violation.

2) Local communities deserve a voice in any waste disposal plan. If the waste disposer makes their "product" truly beneficial to the community and its economy, they will have no trouble finding acceptance. To force questionable projects on communities with significant opposition is shortsighted and destructive. In any county in which the disposal of out-of-state sewage sludge is proposed, at least one well publicized public hearing shall be held. At least 60 days shall elapse between the first publication of said meeting and the date of the meeting. After at least 30 additional days, a county-wide public vote shall be held. Unless a simple majority of qualified voters vote in favor of the land application plan, the plan fails and can not be re-considered for a period of at least two years.

3) No farmer or community may be approached regarding plans to apply out-of-state sewage sludge prior to the certification by USDA, SCS, State Department of Agriculture, and other appropriate state and federal departments that the specific sludge and application plan are beneficial to farming patterns, soil types, climate, and natural resources in the target area.

Many communities in Oklahoma were recently torn apart by a company "running from town to town" in its search for a place to dump massive amounts of sewage sludge. In each case, citizens were told they had "no voice", and had to sacrifice substantial time and money to protect their community, their environment, and their future. Friends were set against friends, before the land application plan was judged to be acceptable.

4) The local SCS office shall monitor the strict adherence to all restrictions, regulations, and approved sludge application plans at each site.

This would enhance local control and trust.

5) All records and test results for all land applied sludge must be available for public perusal at reasonable times.

This would enhance local control and trust.

Export/Import Rules

1) No sewage sludge may be exported from any state **for agricultural land application** unless it meets all requirements for land application in the source state nor until sewage sludge of comparable quality and in similar amounts have been approved and successfully applied in the source state. Any state devoid of agricultural land shall be exempt from this requirement.

At least one state has openly admitted that their sewage sludge is not acceptable for agricultural land application in their state. But, they plan to ship it to another state on an "interim" basis until better treatment makes it suitable for the home state farms.

2) No sewage sludge may be exported from any state for agricultural land application unless the sewage treatment plant producing the sludge has a proven, unblemished record of meeting all treatment regulations with a margin of safety of at least 10% for at least three consecutive years.

Presently, plants with long histories of inadequate treatment, overloaded facilities, and no proven record of environmentally safe sludge production are free to ship sludge for agricultural land application.

3) The USDA will promote the beneficial application of sewage sludge on agricultural land within the "trade area" of each metropolitan area and will strive to ensure that the farmers' benefits from participating in sludge application programs equal or exceed the benefits enjoyed by the city and the sludge disposal operators as a result of the program.

There should be some reciprocity here. The farmers who benefit from trade near to a sludge source and the metropolitan area benefiting from those farmers could work out mutually beneficial agreements.

4) The annual increase in out-of-state sewage sludge disposal in any state shall not exceed 50% of the disposal of in-state source sludge for the previous year.

States with small populations and small tax bases and revenues and limited experience in handling waste disposal problems should not be forced to cope with waste disposal amounts which they are poorly prepared to handle. However, these are the sort of states currently targeted by sludge sources and sludge handlers because of their limited waste regulations and limited economic resources.

5) Sludge may not be imported from out-of-state for agricultural land application unless the sludge is of such a quality that when applied at a rate to meet all the nitrogen requirements of the farm crops grown on the target farm, the projected site "life" is at least 50 years under all applicable regulations and restrictions.

The potential benefit to the farmland and thus to the farmer is directly related to the site life, while the risks are inversely related to the site life.

Research Institution Restrictions

1) No research institution, nor its representatives, who have accepted grants, consulting fees, gifts, other benefits, or promises of any of these from any sludge source, sludge handler, or their representatives or agents, may act as consultants, experts, or researchers in any of the proceedings

related to this bill. Said prohibition shall be in effect for a period of five years from date of the last benefit received or promised, whether of not the said benefit or promise of benefit occurred prior to the enactment of H. R. 4360.

Knowingly violating this provision shall result in the immediate termination of all federal grants benefiting the guilty party, guilty department of the institution, or the entire institution, depending on the extent of institutional involvement in the violation. Said termination of federal funds shall be for a period of at least 3 years and not more than 7 years.

A common practice at the present is to offer a nearby state university soil science department a "grant" to research the sludge application program if the program is accepted by the community and the regulatory agency. The soil scientists then begin making public statements as to the beneficial nature of sludge. There is a clear conflict of interest in such cases.

Post-Application

1) Regulations must be developed which govern the sludge application process from its initial planning and approval through the actual application process and the long term maintenance of sludge applied land.

Almost all the research and regulations are based on an assumption of maintaining certain conditions on sludge applied land. However, there is usually no provision for ensuring that the land is maintained to standards AFTER sludge application ceases.

2) All regulations should take into account the costs of "curing" soil, air, and water problems in the event contamination occurs. When doubt exists, regulations should err in favor of prevention of contamination.

We must avoid a "quick fix" for the metropolitan areas that will tend to pollute our farmlands.

*****

The protection of the health and welfare of the public, our farmland, and the environment is hereby declared a superior concern to that of interstate commerce in all waste disposal matters. In particular, states, counties, and communities may enact more extensive and/or stricter regulations governing waste disposal.

In all sludge application permits, the USDA and SCS shall ensure that adequate time and consideration are allowed before a permit is issued. In particular, if the proposed sludge application plan involves un-researched contents, amounts, site conditions, or crops the permit shall be denied until new research and regulations are completed.

The burden of proof that a particular sludge application program is safe and beneficial rests upon the sludge source and sludge handler. The compilation of research results, regulations, and restrictions pertinent to that specific program must be prepared by the applicant and all costs of the approval process, including but not limited to, the application review, public hearings, public notices and elections, bonds and insurance and site suitability studies must be paid in advance by the applicant.

AMERICAN FARM BUREAU FEDERATION
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April 8, 1992

The Honorable Glenn English, Chairman
House Agriculture Subcommittee on
Conservation, Credit and Rural Development
1430 Longworth House Office Building
Washington, DC 20515

Dear Representative English:

The American Farm Bureau Federation (AFBF) is supportive of your efforts to examine the current regulatory framework for the application of sewage sludge to agricultural lands. We would like to provide both a brief overview of AFBF policy and comments on H.R. 4360 to be included in the hearing record.

AFBF policy supports the safe use of municipal sludge as a voluntary portion of any farmer or ranchers' total management program. AFBF policy specifically states:

> "Government agencies responsible for approving land application systems should allow private agriculture to utilize municipal waste water and sludge, whenever possible, and we will continue our efforts to seek approval of such a policy.
>
> "We believe contracts governing the use of farmland for disposal of such wastes should:
>
> > "(1) Permit voluntary participation by agriculture in a private enterprise system;
> >
> > "(2) Provide flexibility in amount and timing of application of the wastes according to agricultural needs;
> >
> > "(3) Provide indemnity payments for unsaleable crops due to Food and Drug Administration regulations or crop losses caused by components in the wastes;
> >
> > "(4) Provide indemnity for land should it be contaminated because of components in the wastes;
> >
> > "(5) Provide economic incentives for new or improved techniques for handling waste water and sludge; and

> "(6) State that heavy metals and other non-degradable materials have been removed. The responsibility of this must rest with the waste handling authorities."

As you can see from this policy, Farm Bureau is concerned, as you are, about application techniques, testing protocols and the potential liability for farmers and ranchers who may unknowingly apply substandard sludge. AFBF has continually urged farmers and ranchers to ensure that they are protected contractually prior to accepting any sludge applications and to deal only with sludge generators and applicators who have impeccable reputations. But as you are aware, the best efforts of a farmer or rancher can be thwarted by an inept or unscrupulous sludge generator or applicator. Effective regulation is a key to profitable long-term sludge use by farmers and ranchers. What form should regulation take and how should regulation dovetail with existing farm and ranch soil conservation and fertility programs? These are the key questions.

Significant expertise exists within the Soil Conservation Service (SCS) and the Cooperative Extension Service regarding site specific management of soil and nutrient resources. This expertise should be utilized to ensure that the use of sludge is consistent with the overall management plan of a farm or ranch and with the conservation requirements of government laws and regulations. This does not necessarily mean that the United States Department of Agriculture (USDA) should be responsible for sewage sludge throughout the generation and distribution process. The Environmental Protection Agency (EPA) has significant experience testing and monitoring potential environmental contaminants. EPA is currently in the process of rewriting regulations governing the application of sewage sludge. AFBF hopes your committee will look closely at these regulations once formalized to ensure that all sewage sludge products, regardless of point of generation, are delivered to application sites as a known and tested product. If EPA regulations are sufficient to ensure this objective, they will serve the needs of agriculture. In addition, these regulations should include an active role for USDA working with actual application and as a technical information source for EPA regarding the particular constraints faced by agriculture. If EPA is unable to get the testing and monitoring job done in a timely and effective manner, which ensures confidence in farmers, neighbors and municipalities, an expanded role for USDA could be appropriate. We would hope that the committee would look closely at this issue prior to creating an additional level of bureaucracy.

The issue of landowner liability needs to be clearly addressed. AFBF appreciates your efforts in focusing attention on this issue by including language in H.R. 4360 which links "alleviating any adverse effects" and "owning and controlling sludge." It is imperative that this issue be addressed either in the forthcoming EPA regulations or in legislation from your subcommittee.

Finally, AFBF believes strongly that regulation of municipal sludge should be a process which makes no distinctions regarding the point of origination of sludge. The

emphasis should be on the quality of the product delivered for land application not the origin of the product. States and localities should be able to adjust regulatory programs within overall guidelines based on local conditions but not on origin.

Farm Bureau appreciates the opportunity to provide input to the subcommittee. We look forward to working with the committee to ensure adequate regulation of sewage sludge production and USDA involvement in safe, environmentally sound and economical use of sludge by farmers and ranchers who desire to do so.

Sincerely,

John C. Datt
Executive Director
Washington Office

JCD/jb

STATEMENT OF

BIO GRO SYSTEMS, INC.

SUBMITTED TO THE

SUBCOMMITTEE ON CONSERVATION, CREDIT, AND RURAL DEVELOPMENT

HOUSE AGRICULTURE COMMITTEE HEARING REGARDING

BENEFICIAL USE OF SLUDGE AND HR 4360

APRIL 2, 1992

JANE B. FORSTE

DIRECTOR OF TECHNICAL SERVICES

BIO GRO SYSTEMS, INC.

COMMENTS ON H.R. 4360, AGRICULTURAL SUBCOMMITTEE

Mr. Chairman, members of the Committee, I appreciate the opportunity to provide comments on behalf of Bio Gro Systems, Inc., Annapolis, Maryland on H.R. 4360, amendments to the Soil Conservation and Domestic Allotment Act.

My academic training includes B.S. and M.S. degrees in agronomy; I am a Certified Professional Agronomist and have also had extensive work experience in the field of wastewater treatment. For the past 11 years I have worked for Bio Gro Systems where I currently serve as Director of Technical Services. Bio Gro provides sludge management services to municipal clients throughout the United States, with emphasis on the beneficial use of sludge biosolids, particularly through land application. Our technical staff is comprised of agricultural specialists, such as agronomists and soil scientists, as well as many individuals who have had hands-on experience in managing farming operations. Since 1978, we have operated projects in 17 states from coast to coast applying sludge to agricultural land to enhance crop production. Some of the these projects have entailed transporting sludge across state boundaries in order to meet the needs and the desires of the farming communities.

I believe our qualifications and experience provide us with a unique perspective on the practical implementation of regulatory programs in the farm setting. Because we work closely with the farmers who participate in our programs, we appreciate and share the Committee's concern for protecting their means of livelihood as well as protecting the environment and public health.

As contractors to municipal sludge generators, we provide the management services to insure that sludges produced from their facilities are land applied in accordance with Federal and State

regulations. Our bonded and insured contracts with generators require that we operate in accordance with all applicable regulations and that we do not accept a sludge which does not meet all standards required for land application. It has been our observation that generators who elect to contract for land application for some or all of the sludge they produce are deeply concerned that the sludge meet regulatory standards so that it can continue to be removed from their facility. Backlogs within the treatment system due to inadequate solids removal may result in violation of NPDES water quality standards with resultant enforcement action. Similarly, municipalities practicing land application recognize that significant industrial contamination could jeopardize their ability to use sludge as an agricultural commodity. The dramatic improvements in sludge quality (e.g., lower levels of metals) which have been achieved in the last decade as a result of industrial pretreatment programs provides strong testimony to the commitment of generators throughout the U.S. to achieving appropriate sludge quality standards and thereby protecting their beneficial use options.

One of the most significant barriers to land application and beneficial use has been the misperception by the general public of the nature of sludge products as well as a lack of understanding of the safeguards incorporated into Federal and State programs. As a contractor, we have developed public outreach programs for each of our projects tailored to the needs of the specific situation. As part of state permitting processes, we provide technical and agronomic information to the farmers who participate voluntarily in our programs. We also work with neighboring communities and individuals to demonstrate both the efficacy and safety of the programs that exist today. After decades of land applying and otherwise beneficially using sludges, there has yet to be found a documented instance of a negative environmental or human health impact resulting from a regulated program.

As noted in the testimony submitted by several organizations at the April 2, 1992 hearing on H.R. 4360, the emerging technical regulations from the U.S. EPA (40 CFR Part 503) represent the consensus of the foremost agricultural researchers throughout the country, including USDA. We believe that their participation will ensure that this precedent-setting, comprehensive, risk based Rule will be based on the most valid and relevant data available. The 503 regulations will protect humans, agricultural crops and all potential exposed organisms in the soil, water and air at sites where sludge is applied to the land. The massive gathering of data from decades of research at USDA and land grant universities across the country provides assurance that these regulations will address all legitimate concerns. State programs administering the 503 regulations will continue to provide mechanisms for beneficially recycling (as biosolids) the nutrients and organic matter resources contained in our nation's sludges.

The 503 technical standards provide a framework for regulations based on worst case scenarios which are extremely protective of the environment. Such standards will also provide significant liability protection through their conservative and comprehensive approach based on negligible risk. While the regulations will provide for a site specific approach (i.e., a relaxation of the numerical and management standards) such exceptions will require detailed risk analysis and are not likely to be widely used.

The "clean sludge" numbers proposed for unlimited application of biosolids to farmland (and the numerically identical field loading limits for biosolids exceeding the "clean sludge" numbers) insure a material that is safe and acceptable for use when it reaches the farm. As such, it should be regulated as a nutrient source under the 503 standards. To insure that such standards are met, states can require additional data from any sludge source (including those of marginal quality or those

coming from out-of-state). Such monitoring requirements will serve to verify the safety of the practice of land application and provide public assurance that the standards are being met.

Current (1979) Federal regulations were developed with input and consultation similar to (although less comprehensive than) that provided for the 503 Rule. With USDA guidelines, these regulations have become the basis for guidelines or regulations in many state programs. Frequently, these state programs also include advisory input from USDA, Extension and Soil Conservation Services, and other agricultural groups. Their input is extremely valuable in developing workable land application programs and is needed during the implementation of EPA's 503 technical standards. This implementation will occur through specific state programs required under EPA's companion 501 Rule (State Sludge Management Programs). The intent of the 501 State Sludge Management Programs is to build upon and reinforce existing state programs, which we believe is the most realistic way to implement a federal program which has such local interests and impacts. Good state programs will manage and enforce the general technical standards of the 503 Rule as a baseline which is protective of all environmental and agricultural pathways. I have included in Attachment 1 a two-part article which describes the approach taken by the agricultural Peer Review Committee (PRC) in developing valid, risk-based standards for inclusion in the final 503 Rule, along with other scientific data relating to land application and its environmental impacts.

Site specific permitting for land application is presently managed by state programs and this will most likely continue for the foreseeable future. In states where land application is practiced, both informal and formal mechanisms exist to solicit input from Extension Service, SCS and other agricultural interests. Their advice keeps farmers (who are the ultimate users) informed as to the appropriate use of biosolids in their

overall nutrient management strategies. We strongly believe that the advisory role of the agricultural organizations is an extremely valuable component in developing land application programs and should be continued as such rather than altered to include a regulatory function as proposed in H.R. 4360.

Our experience in managing land application programs has shown us that state permitting programs have developed significantly in the years between EPA's 1979 (40 CFR 257) Rule and the 503 Rule due for final promulgation in July, 1992. These programs are based on both Federal guidelines and the needs of individual states and regions. They are usually quite detailed with respect to site specific considerations, and we believe that the states remain the best vehicle for addressing specific regional concerns (generally through individual counties). Such programs can readily incorporate the new 503 technical standards which are based on negligible risk to the environment, the human population, crops and animals under worst-case conditions. Any remaining considerations involve integrating land application with agronomic management practices which are site specific and can be developed by the states.

With scarce resources available for virtually all government programs, we believe that SCS, Extension, USDA and other agricultural agencies provide the best source of advice on the agronomic issues that relate to land application. Once sludge has been approved for land application through existing state and federal programs, it is a fertilizer substitute and soil conditioner. Therefore, any management considerations should be part of larger management issues (e.g., nutrient and other best management practices) relating to a particular farm. States already impose limits on nitrogen applied through land application, along with restrictions on slope of land and proximity to surface water, drinking water sources and other potentially sensitive features. Land application programs

operate within the context of existing conservation plans, nutrient management plans, and other mechanisms for maximizing crop production while minimizing environmental impact.

Increasing pressures on agricultural producers to address the issues of nutrient management and environmental protection require the development of programs which make sense both environmentally and economically; land application is only one component of this larger goal. Singling out sludge transported interstate (which may be of higher quality and greater value than some intrastate sludges) would create an unjustifiably negative perception of land application. It would also have a dampening effect on the efforts which have produced high quality sludges which pose negligible risk, regardless of origin. We should continue to: (1) enforce local pretreatment standards; and (2) develop and implement reasonable and workable state programs for land application as part of overall resource management. While the goals of H. R. 4360 are not incompatible with these goals, we believe that the combination of mandatory state programs with the independently enforceable federal technical standards contained in the 501/503 federal programs will better serve to achieve these goals. At the same time, the agricultural community can continue to rely on the support from agricultural organizations in their traditional advisory, rather than a regulatory, role.

I am enclosing some newspaper accounts (Attachment 2) which illustrate both the public acceptability of land application programs and the enthusiasm with which farmers participate in these programs. I appreciate the opportunity to provide these comments on H.R. 4360 and would be happy to answer any questions or provide additional information to the Committee or the staff.

kw:JBF010

ATTACHMENT 1

Technical Data

REGULATING BENEFICIAL USE

TWENTY YEARS OF LAND APPLICATION RESEARCH

Research data from low metal sludges applied in the field over many years are the only real basis to make regulations for land application of sewage sludge.

Rufus L. Chaney

Part I

SINCE ABOUT 1970, scientific research has been conducted to assess the benefits and risks of using municipal sewage sludge on cropland. This paper is an attempt to summarize information that is the single most important lesson about using sludge — that primary research findings are the basis for regulations. Anytime these research results are ignored during preparation of a regulation, that regulation is bound to have problems.

When good research information exists on a subject that is to be regulated, public and private groups may easily work with the U.S. Environmental Protection Agency (EPA) to make regulations based on that information. It is more difficult when research is incomplete or fragmented, as resulted from the inadequate database on sludge applied organic pollutants. Heavy metals were studied since 1970, but organic pollutant research began in the early 1980s and then research died because of funding limitations. Enough information was available to make the appropriate regulation, but these research results were hard to assemble, and required the special knowledge of scientists working in that area to find the information.

One of the most important findings of sludge research is a recent conclusion that we can define a "no observed adverse effect level" (NOAEL) quality sludge. These findings resulted in the "Clean Sludge" definition in Chaney (1989). Much work has shown that sludges can be beneficial. These NOAEL sludges, however, have especially low risk, as repeatedly demonstrated by research. As will be shown below, the adsorption of metals and organics by adsorption sites in sludges is the technical reason why equal amounts of metals or organics can be applied in NOAEL sludges without effects, while additions of pure chemicals to soils can cause adverse effects. This finding may help explain why there is a technical basis for increasing the cumulative metals and cumulative organic pollutant application rates in the new Clean Water Act 503 Regulation rather than to lower the cumulative loadings as originally proposed by EPA. The misunderstandings, the errors, and misinterpretations of existing data that perhaps confused and led EPA staff to the present 503 draft have to be understood in their entirety in relation to sludge research. Research data from low metal sludges applied in the field over many years are the only real basis to make regulations for land application of sewage sludge.

BENEFITS OF SLUDGE

First, we should note that there are reasons why we want to use sludge on cropland. In terms of ground water protection, organic nitrogen in sludge is much less likely to cause ground water pollution then chemical N-fertilizers. Sludge phosphorus is also very valuable on cropland. In some soils, other nutrients can be beneficial. For example, with iron deficient calcareous soils, sludge is a remarkably beneficial iron fertilizer that simply cannot be replaced with any normal commercial fertilizer.

Zinc and copper are often deficient or becoming deficient in soils that have been used to produce crops for many decades. Sludge is a very good way to apply zinc or copper rather than buying pure salts. Organic matter is always beneficial in soil. Because hydrated lime is used in sludge dewatering at many locations to save sludge transport costs, some sludges have enough lime, or lime equivalent, in them to provide much cost savings to farmers. Of course, utilization of sludge has to be done in such a way as to prevent application of excessive nitrogen, and to control erosion. Sludge eroding into surface water bodies can release nutrients which contribute to eutrophication. Excessive organic nitrogen can cause excessive nitrate leaching to ground water, so nitrogen applications are limited to the requirement of crops to be grown.

The soil conditioner properties of sludge have exceptionally beneficial uses in revegetation of disturbed land. Whether it is using sludge as a soil conditioner for a coal or other mine spoil that needs to be revegetated, a

landfill that is being vegetated, or disturbed land from urban construction, no better way to solve these environmental problems has been found. Many locations use sewage sludge or sludge compost at a high cumulative application rate to revegetate and prevent the environmental hazards from the water or air pollution from these disturbed land areas.

One last aspect of sludge use on cropland that should never be forgotten is that beneficial use lowers the net cost to society. Society pays for sludge handling, be it land application or incineration. Taxpayers need regulations for sludge utilization based on proper research findings so that the minimum cost associated with environmental protection can be obtained.

REGULATORY RATIONALE

Why has there been such concern that utilization of sewage sludge be properly regulated? Everybody knows that compared to their soil, food, or drinking water, sludge is contaminated — with metals, organics, and pathogens. This doesn't mean, however, that sludge cannot be a valuable resource. Historically, the pretreatment of industrial wastes did not exist in many cities until the last five years or even less. Some cities' sludges have always been low in metals. But others were extremely high before sludge regulations were introduced. In most cities, pretreatment by industry stopped problems of sludge contamination at levels unacceptable to agriculture. Experience shows that when cities have implemented pretreatment, it often actually has recovered funds for industry. This is not the situation with every heavy metal, but it is for most. Pretreatment is possible — and necessary.

REGULATION DEVELOPMENT

Sludge utilization was first regulated in 1979 (US-EPA, 1979a). Attempts to complete the regulation and include distribution and marketing of sludge and composted sludge products were near completion in 1981, but then stopped. Congress subsequently passed the Clean Water Act, Section 503, which required EPA to develop a complete set of regulations that protects different environmental media equally. During the last decade, as EPA worked toward the new regulations, methods to assess the risk of sludge applied contaminant transfer in food chains, etc., were identified. These methods were reduced to the 12 fundamental pathways for risk assessment shown in Table 1 (EPA, 1989). Some are obvious pathways, such as plant uptake of contaminants from soils, and transport into plant tissues used as foods by humans. Pathway 1 assesses the national average effect on human diets, while Pathway 1F considers that an individual grows a large fraction of garden vegetables on sludge amended soils after a sludge utilization program ended and the land was converted to residential use. Table 1 also shows the Most Exposed Individuals, the persons or other environmental receptors which are most exposed to the possible effects of sludge applied contaminants.

Researchers generally agree that the pathways EPA used are valuable, important and dare not be ignored (Page et al., 1989). We developed most of these pathways to be considered for risk assessment of sludge application on agricultural cropland, and EPA added several more that we had not yet set into quantitative models for risk assessment. Pathways for environmental toxicity and transfer are the only way to scientifically evaluate risk.

In the case of sludge, we had considered contaminant transfer based on processes in soils and plants. We knew that plant uptake of contaminants in soil-sludge mixtures was one pathway; metals in the soil solution move from the soil particles to the roots, are absorbed in the roots, and then translocated to other plant parts. Organic compounds applied in sludges usually move through the soil air by volatilization rather than by dissolution in the soil water. This allows transfer to the plant roots or foliage, particularly into the peel of carrot storage roots. One of the most important pathways, however, the pathway that is probably most limiting of all, has to do with direct sludge ingestion by grazing livestock (Pathway 4 or 6) or children (Pathway 2F). The sludge is sprayed on the crop or remains on the soil surface. It allows the direct transfer of all pollutants, not just the ones taken up by plants.

Surface application is perhaps the least expensive way to apply sludge if land is available at short hauling distances — whether one uses high flotation trucks or simpler equipment used for application of liquid manure. Sludge that dries on the plant adheres for a long time, and is not washed off by rainfall after it dries. Figure 1 shows two blades of tall fescue picked in a field to which sludge had been spray applied 21 days before the leaves were examined. The left blade had

Figure 1: Grass blades illustrate Pathway 4-Surface, a pasture field to which sludge has been sprayed.

Table 1. Pathways for risk assessment for potential transfer of sludge-applied trace contaminants.

	Pathway	Most Exposed Individual
1	Sludge→Soil→Plant→Human	General Food Chain: 2.5% of food.
1F	Sludge→Soil→Plant→Human	Home Garden After 5 yr; 60% leaf veg.
2F	Sludge→Soil→Human	Residential Soil, 5 yr; 200 mg soil/d.
2-D&M	Sludge→Human	Sludge product; 200 mg sludge/d.
3	Sludge→Soil→Plant→Animal→Human	Farms; 40% of meat.
4-Surface	Sludge→Animal→Human	Farms; 40% of meat.
4-Mixed	Sludge→Soil→Animal→Human	Farms; 40% of meat.
5	Sludge→Soil→Plant→Animal	Livestock feeds; 100% on sludged land.
6	Sludge→Soil→Animal	Grazing Livestock; 1.5% sludge in diet.
7	Sludge→Soil→Plant	"Crops"; strongly acidic sludged soil.
8	Sludge→Soil→Soil Biota	Earthworms, slugs in sludged soil.
9	Sludge→Soil→Soil Biota→Predator	Birds; 33% diet affected by sludge.
10	Sludge→Soil→Airborne Dust→Human	Tractor operator.
11	Sludge→Soil→Surface Water→Human	Water quality Criteria.
12	Sludge→Soil→Air→Human	Farm households.
12W	Sludge→Soil→Groundwater→Human	Well water on farms; 100% of supply.

These pathways for risk assessment relate to humans, livestock or the environment, and the Most Exposed Individual to be protected by a regulation based on the Pathway Analysis (EPA, 1989; O'Connor et al., 1989)

grown from the base of the plant since sludge was applied, but the right blade was covered with sludge after application and has sludge residue adhering after 21 days. Chaney and Lloyd (1979) reported that forages could reach over 15 percent sludge (dry matter basis) if standing crops of forage were sprayed with sludge immediately before grazing or harvest. These grass blades illustrate Pathway 4-Surface, a pasture field to which sludge is spray applied. Based on research of this type, recommendations and regulations were developed requiring that the crop be clipped or grazed to a low height before spray application, and that there be a minimum 30 day waiting period before grazing livestock were allowed to enter the field.

This highest possible exposure to sludge applied contaminants can be avoided by using subsurface injection equipment, or mixing the sludge into the plow layer soil before the grazing crop is seeded. If sludge contains excessive levels of contaminants as assessed for Pathway 4-Surface, levels which can cause risk by direct ingestion of sludge by livestock, states can impose the requirement of injection or mixing. Therefore Pathway 4 is no longer a risk because the environmental exposure to the animals is lessened about 50 fold for organics, and proportionally to dilution for metals.

Subsurface injection of liquid or dewatered sludges is the "best available technology" for application on pastures. Injection prevents direct sludge ingestion by livestock, malodor, and nitrogen loss. It is not always required. Land owners in rural communities are more tolerant of odors than many people are nearer cities. But the combination of malodor, loss of nitrogen to the air, and sludge adherence on the grass are good enough reasons to conclude that injection is the best technology for this practice. Some large cities actually dewater the sludge, haul it out to the countryside, and then add water back in to pump it into trucks to use the injection equipment.

SOIL PLANT BARRIER

The pathway analysis enables us to break down the table of elements into what happens to each when they are mixed in soil or present in sludge on the soil surface and so on. Chaney (1980) introduced the concept of the "Soil-Plant Barrier" for consideration of potential toxicity to the food chain if trace elements are applied to soils. A first group of metals includes those that are so insoluble or so strongly adsorbed to soil or in plant roots that they are not translocated into edible plant parts. For example, lead is so insoluble inside the plant root, and mercury is so bound inside the fibrous plant roots, that they don't get into the edible plant parts. Mercury can be transferred through volatilization from the soil surface to plant foliage, but this is not very significant because modern sludges are low in mercury.

Of the elements that are actually taken up by plants from sludge treated soils, some can reduce the yield or even kill crops. This "phytotoxicity" happened when sludge quality was poorly regulated, for example, due to long term sludge application before anyone recognized that sludges were contaminated with heavy metals. Phytotoxicity resulted wherever very strongly acid soils, metal-sensitive crops and sludges with high concentrations of pollutants were combined (for review, see Chaney and Giordano, 1977; Logan and Chaney, 1983). If excessive amounts of zinc, copper, or nickel are applied to strongly acidic soils, the metals can cause phytotoxicity. However neither the level of metal in the forage crop, nor the grain, would be high enough to injure livestock if fed to cattle or if ingested by wildlife. Thus, phytotoxicity prevents excessive plant uptake compared to levels tolerated by animals, and the food chain is protected.

There are exceptions to the protections provided by the Soil-Plant Barrier, exceptions which have been the focus of intense research in agriculture. Livestock have been injured by soils with excessive selenium or molybdenum for centuries, and human injury from soil cadmium was identified in 1969. Cadmium is easily absorbed by crops and can reach levels that are dangerous if the consumer eats foods grown on a cadmium contaminated soil for a lifetime. Human disease from soil cadmium occurred in Japan where mining wastes polluted paddy rice fields, and farm families consumed the rice grown on these paddies for a lifetime (Chaney et al., 1987).

There could be a similar incidence if selenium were accumulated in sludge, because it is easily absorbed by plants when added in high quantities. But municipal sewage sludges are not high in selenium. Similarly

Table 2. Maximum tolerable levels of dietary minerals for domestic livestock in comparison with levels in forages.

Element		Level in Plant Foliage[a]		Maximum Levels Chronically Tolerated[b]			
	"Soil-Plant Barrier"	Normal	Phytotoxic	Cattle	Sheep	Swine	Chicken
		–mg/kg dry foliage–		——mg/kg dry diet——			
As, inorg.	yes	0.01-1	3-10	50.	50.	50.	50.
B	yes	7-75	75	150.	(150.)	(150.)	(150.)
Cd[c]	Fails	0.1-1	5-700	0.5	0.5	0.5	0.5
Cr[3+]	yes	0.1-1	20	(3000.)	(3000.)	(3000.)	3000.
Co	Fail?	0.01-0.3	25-100	10.	10.	10.	10.
Cu	yes	3-20	25-40	100.	25.	250.	300.
F	yes?	1-5	—	40.	60.	150.	200.
Fe	yes	30-300	—	1000.	500.	3000.	1000.
Mn	?	15-150	400-2000	1000.	1000.	400.	2000.
Mo	Fails	0.1-3.0	100	10.	10.	20.	100.
Ni	yes	0.1-5	50-100	50.	(50.)	(100.)	(300.)
Pb[c]	yes	2-5	—	30.	30.	30.	30.
Se	Fails	0.1-2	100	(2.)	(2.)	2.	2.
V	yes?	0.1-1	10	50.	50.	(10.)	10.
Zn	yes	15-150	500-1500	500.	300.	1000.	1000.

[a] *Based on literature summarized in Chaney (1983).*
[b] *Based on NRS (1980). Continuous long-term feeding of minerals at the maximum tolerable levels may cause adverse effects. Levels in parentheses were estimated (by NRC) by extrapolating between animal species.*
[c] *Maximum levels tolerated were based on Cd or Pb in liver, kidney, and bone in foods for humans rather than simple tolerance by the animals.*

for livestock, soil molybdenum is also a potentially toxic element, but only a very, very low percentage of sludges have industrial contamination with molybdenum. And that problem could be completely corrected by pretreatment.

As noted above, the Soil-Plant Barrier protection can be circumvented by direct sludge ingestion. Where certain levels are exceeded, the sludge will have to be applied by injection. Table 2 contains an overview of these considerations for the trace elements which were originally considered of concern for land application of sludges. The table shows the element concentration which can be reached at the point where the crop suffers phytotoxicity, compared to the concentration of that element tolerated by livestock fed diets with varied levels of the element for a long period (chronic tolerance tests; NRC, 1980). This detailed consideration confirms the concepts of the Soil-Plant Barrier. Only molybdenum, selenium and possibly cobalt toxicity to livestock, and cadmium and selenium toxicity to humans and other monogastric animals would be expected if, for a lifetime, individuals consumed crops suffering phytotoxicity from these elements.

Nickel is one example from the table for which the Soil-Plant Barrier is quite protective of both livestock and humans. A 25 percent yield reduction of most plants occurs when plants have 50 to 100 ppm in their leaves. However, nickel toxicity to cattle doesn't occur until they are fed 200 ppm for a long period, and this is from nickel salts added to the diet. There is some evidence that the concentration of nickel tolerated might even be higher in the case of metal in the crop. Nickel does interact with other elements like iron, zinc, copper and so on, and deficiencies of these elements might make nickel more toxic to livestock. Thus, zinc or iron deficient diets could lead to higher risk potential. But there can be no zinc deficient forages when sludge is used because sludge adds fertilizer amounts of zinc to the soil. In this case, a zinc deficient cow is not the more sensitive individual for consideration of sludge applied nickel, because the very act of eating sludge fertilized forages prevents the cow from being zinc deficient.

This concept is part of "Environmental Toxicology," a holistic consideration of all aspects of potential toxicity from trace elements or organics in the environment. Thus, the primary concern about sludge nickel is the need to prevent phytotoxicity, not the need to protect livestock. Even the case of ingested sludge does not have the potential to cause toxicity to livestock except for very highly polluted sludges unacceptable in agriculture. Pathway 1 or 1F, garden vegetables for human consumption, is also safe because phytotoxicity protects humans, too. And we have no evidence of wildlife being affected, except by reduction in biomass to eat.

Another example of metal interaction preventing toxicity was found when we were assessing the risk of sludge Cu to livestock. It has been known for many years that addition of modest amounts of Cu salts to diets of sheep or other ruminant livestock can cause severe Cu toxicity and even kill the animals. In contrast to Cu salts mixed with diets, Cu in sludge fed to livestock has low bioavailability. Other elements in sludge, particularly Zn, Fe, and S, interfere with Cu absorption, and organic matter in sludge strongly adsorbs Cu. Each of these interactions reduces the bioavailability of copper in ingested sludge. Because these interacting factors reduce Cu absorption, ingested sludge has been found to lower liver Cu stores rather than cause Cu toxicity, even though equal levels of soluble Cu salts in the diet would poison the animals (Decker et al., 1980; Bertrand et al., 1981; Baxter et al., 1982).

These examples of Soil-Plant Barrier, and Environmental Toxicology, provide a sense of why the pathways were developed to estimate the risk of trace elements in land applied sludges. In order to develop an appropriate regulation, and guidance for sludge use, we have to look at every potentially toxic constituent in sludges and evaluate the risk using the pathways as EPA was trying to do under the 503 regulations. Proper use

Subsurface injection of liquid or dewatered sludges is the "best available technology" for application on pastures. Injection prevents direct sludge ingestion by livestock, malodor and nitrogen loss.

of the pathway risk assessment, however, requires using data from experiments which actually used sewage sludge in the field, or involved feeding sewage sludge to livestock.

MISINTERPRETING DATA

During the work to prepare the proposed 503 rule, EPA staff found it difficult to determine how to establish regulations to protect against phytotoxicity of sludge applied metals. They failed to take into account the findings of sludge researchers who had repeatedly found that additions of metal salts to soils did not simulate addition of sludge metals (see Logan and Chaney, 1983). The EPA staff were unable to find data from sludge field studies which showed copper, zinc, or nickel phytotoxicity to plants. So they looked at greenhouse pot studies. This method to study trace element uptake has been shown to estimate excessive toxicity and uptake compared to the field. Unlike the field where roots grow deeply into the soil, roots in pots are confined to the treated soil. Further, the nature of water uptake in greenhouse studies causes higher leaf concentrations of metals per unit soil metals compared to the field. However, few pot studies with sludges showed phytotoxicity, and pot studies with soluble metal salts gave nice linear slopes for plant:soil relationships. So they used metal salts added to pots to develop their rule.

Published research results show how easy it is to go wrong if important scientific principles about soils and sludges are ignored. When metal salts are added, one sees a relatively linear response of increased plant metal concentration with increasing soil concentration. Increased soil pH lowers the slope of the relationship, as does soil with greater organic matter or clay content. This fits our theory of soil science. But it's irrelevant to sludge regulation because if sludges are added to soil rather than metal salts, instead of having the linear response to increasing soil metal levels, there is a plateau response (Figure 2).

Figure 2: Plateau response of lettuce to cadmium applied in two sludges.

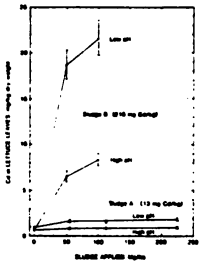

Figure 2 shows the plateau response of lettuce to cadmium applied in two sludges added at several rates on a sandy loam soil in Beltsville. Lettuce was grown in the field each year. The means in the figure are an average of eight crop years of lettuce. Applying a low cadmium sludge A (13 ppm Cd) at up to a 100 tons per acre (224 Mt/ha) with a recommended soil pH, there was no increase in crop cadmium — zero change or zero slope. With the strongly acidic soil pH, there was a slight increase in lettuce cadmium from the first increment of sludge, but then it plateaued to zero slope. The slope is not significantly different from zero. With high cadmium sludge B used in the study, it is clear that the plant:soil curve sharply bends off at the higher rate. It is not a linear response extending to infinity. These data confirm the plateau model, as do the data from many other field experiments with sewage sludge.

These experiments were not designed initially to evaluate the plateau model. But if you evaluate data from the second year after applying sludges in the field, you can begin to see the data fits a plateau model (Bidwell & Dowdy, 1987). The book chapter by Corey et al. (1987) summarizes how this can result. Corey et al. (1987) concluded that we must consider not only the metals in the sludge, but the metal adsorption capacity of the sludge. If sludges add sufficient metal adsorption capacity to the soil, the soil-sludge mixture no longer has the properties of the soil, but is changed to the metal adsorption properties of the sludge. Hydrous iron oxides, organic matter, and perhaps other adsorption surfaces of the sludge can bind metals in the soil-sludge mixture, and predominate over soil adsorption sites. Thus, the plateau is a natural property of the high metal adsorption capacity of sewage sludges.

The review by Chang et al. (1987) considered the effect of sludge application on crop metal concentrations over time after the initial application. The first year plant response may appear to be linear due to organic matter degradation in the soil (Bidwell & Dowdy, 1987). It is important to remember that it takes high sludge applications to achieve high metal application rates — sludge rates far in excess of the nitrogen requirement of crops. This is an inherent requirement of research, if we are to get the study done this decade rather than waiting 100 years to learn the crop response.

There was an argument for many years about whether sludge metal additions were additive. In a sense they aren't additive (not linearly additive) but now we understand it is all because of the plateau response. If the first increment of sludge raises the metal availability to plants up to the level controlled by the quality of the sludge, further sludge additions do not increase the uptake by plants. So while uptake appears non additive with increasing sludge rate, the adsorption phenomenon shows us that it was additive, but within the plateau response range. Some sludges may be so low in metals, yet so high in hydrous iron oxide and other adsorption sites that application of the sludge actually reduces metal uptake by crops. This response has actually been observed in research studies. Based on these findings, I expect that, in the next decade, research will lead to "designer sludges" for which POTWs will choose to add iron (e.g. iron from waste sources that might otherwise be a pollution problem) during sewage treatment or sludge processing to improve the metal adsorption capacity of the sludge and thereby lower the risk of increased metal uptake from sludge utilization.

PART TWO

The second part of this review of land application research and its impact on regulation development will start by discussing the impact of sludge utilization on the human diet, particularly the effects of cadmium. The report concludes with an updated look at the proposed Part 503 sludge management regulations — both the findings of the Peer Review Committee established in 1989 to review the sludge utilization components of

the rule and the latest developments with the "clean sludge" concept. ■

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FOOD CHAIN IMPACT

PUBLIC HEALTH AND

Land application research has produced conclusive findings on the effects of sludge utilization on the human diet, particularly the impact of cadmium.

Rufus L. Chaney

Part II

PART ONE OF this review of land application research (*BioCycle*, September 1990) discussed the benefits of sludge utilization, the rationale for regulating its use, and the development of those regulations. It also introduced the concept of "environmental toxicology," and took a close look at the soil-plant barrier effect and its impact on the potential toxicity of elements in the sludge.

Part Two of this article starts by discussing the impact of sludge utilization on the human diet, particularly the effects of cadmium. The report concludes with an updated look at the Part 503 sludge management regulations — both the findings of the Peer Review Committee established in 1989 to review the sludge utilization components of the rule and the latest developments with the "clean sludge" concept.

CADMIUM, FOOD CHAIN PATHWAYS

Pathways 1 and 1F use a human diet model (see Table 1, reprinted from Part I). The modeled persons should be individuals with the highest exposure to sludge applied metals due to ingesting crops grown on sludge amended soils. As noted in Chaney et al. (1987), one has to consider that the crops differ in relative cadmium uptake even though all approach a plateau with increasing sludge application rate. Lettuce and spinach have high response, while bean, rice, and many other crops hardly pick up any cadmium even when there is a high amount added to the soil. Other crops are in between lettuce and beans.

Pathway 1 requires that we integrate the data on food consumption and cadmium uptake. The best approach we have found (Chaney et al., 1987; EPA, 1989) to evaluating impact on the human diet is to use information from the Food and Drug Administration on the nature of the U.S. population and U.S. diet (broken into food groups), using the amount of foods consumed per day in the 1980 survey of food consumption (Pennington, 1983). Chaney et al. (1987) took into account the water content of foods, and calculated the daily adult intake of grains and vegetable foods on a dry weight basis. Adults were used because I believe we should be as quantitative as possible in assessing risks. This means using an average lifetime diet model rather than the teenage male diet model (used by EPA in its first sludge regulation), because cadmium and PCB risks are chronic lifetime risks. In other words, it takes a lifetime of excessive exposure to reach the point of the initial health effect due to excessive cadmium ingestion.

Cadmium accumulates in the kidney slowly over one's lifetime. In the U.S., we reach on average about one-tenth as much cadmium in our kidney at age 50 (peak kidney cadmium levels) as would be required to cause the first indication of possible injury to the most sensitive part of the population. And we have a great protection against excessive dietary cadmium. For the 503 proposed regulation, EPA (1989) used the maximum food consuming age-by-sex group rather than the teenage male. This had the effect of using milk consumption rates of babies for a lifetime, and other irrational food intake rates.

Table 2 shows a comparison of the food intakes of these different modeling efforts. EPA (1979) is from the Background Document (US-EPA, 1979b) which was the basis for the 1979 EPA sludge regulation. EPA 1981 is from the first attempt (never publicly proposed) to use the food survey data analyzed by Pennington (1983). Chaney et al. (1987) is the combining of dry weights into food groups, including high and low Cd uptake subgroups. The 1990 lifetime model is the present best estimate of average lifetime intakes of dry weight of food groups. The Pennington data included complex mixed foods (e.g. chicken pot pie, or carrots and peas). These were separated into individual raw food sources by EPA (1989) for the age-by-sex groups in the Pennington dataset. The age-by-sex groups were averaged by sex, and each age group used to represent different parts of the 70 year lifetime exposure.

Another point which must be considered in estimating the effect of sludge utilization on cadmium intake from garden vegetables is

Table 1. Pathways for risk assessment for potential transfer of sludge-applied trace contaminants.

	Pathway	Most Exposed Individual
1	Sludge→Soil→Plant→Human	General Food Chain; 2.5% of food.
1F	Sludge→Soil→Plant→Human	Home Garden After 5 yr; 60% leaf veg.
2F	Sludge→Soil→Human	Residential Soil. 5 yr; 200 mg soil/d.
2-D&M	Sludge→Human	Sludge product; 200 mg sludge/d.
3	Sludge→Soil→Plant→Animal→Human	Farms; 40% of meat.
4-Surface	Sludge→Animal→Human	Farms; 40% of meat.
4-Mixed	Sludge→Soil→Animal→Human	Farms; 40% of meat.
5	Sludge→Soil→Plant→Animal	Livestock feeds; 100% on sludged land.
6	Sludge→Soil→Animal	Grazing Livestock; 1.5% sludge in diet.
7	Sludge→Soil→Plant	"Crops"; strongly acidic sludged soil.
8	Sludge→Soil→Soil Biota	Earthworms, slugs in sludged soil.
9	Sludge→Soil→Soil Biota→Predator	Birds; 33% diet affected by sludge.
10	Sludge→Soil→Airborne Dust→Human	Tractor operator.
11	Sludge→Soil→Surface Water→Human	Water Quality Criteria.
12	Sludge→Soil→Air→Human	Farm households.
12W	Sludge→Soil→Groundwater→Human	Well water on farms; 100% of supply.

These pathways apply to humans, livestock, or the environment, and the Most Exposed Individual to be protected by a regulation based on the Pathway Analysis (EPA, 1988; O'Connor et al., 1988).

SLUDGE UTILIZATION

Table 2. Comparison of food intakes in the EPA (1979), 1981 EPA DRAFT, Chaney et al. (1987) and present lifetime average intake model to estimate dietary Cd intake from home gardens.

Food Group	EPA, 1979	EPA, 1981	Chaney, 1987	1990
	—Teenage Male—		Adult	Lifetime
	g dry weight/d			
Food intakes:				
Leafy Vegetables	4.95	2.34	2.40	1.97
Potato	43.9	15.36	24.06	15.60
Root Vegetables	2.64	1.04	2.04	1.60
Legume Vegetables	13.1	7.22	12.64	8.75
Garden Fruits	5.52	3.69	7.99	4.15

Table 4. Comparison of estimated increased dietary Cd intakes in the EPA (1979), 1981 EPA draft, Chaney et al. (1987) and 1990 models for increased dietary Cd intake form ingesting 100% of garden vegetables grown on the home gardens treated with sewage sludge for a lifetime.

Food Group	EPA, 1979	EPA, 1981	Chaney, 1987	1990
	—Teenage Male—		Adult	Lifetime
Estimated Relative Food Group Increased Cd Intake: (μg Cd/d if lettuce increased 1 μg/g dry wt.)				
Leafy Vegetables	4.95	2.34	1.288	1.056
Potato	0.88	0.307	0.481	0.312
Root Vegetables	0.61	0.239	0.198	0.154
Legume Vegetables	0.52	0.289	0.126	0.088
Garden Fruits	0.94	0.612	0.113	0.056
Increased Dietary Cd (μg/d if lettuce increased 1 μg/g dry wt.)				
All Garden Foods	7.90	3.79	2.20	1.67
Relative Intake	4.73	2.27	1.32	1.00

the ability of different food groups to accumulate soil cadmium. Table 3 shows the relative increase in cadmium in different food groups compared to that of lettuce. In the diet cadmium modeling effort of Ryan et al. (1982), the cadmium uptake slope of lettuce was used to predict the effect of using sludge on increased dietary cadmium from all foods. In the 1979 EPA regulation, the cadmium uptake slope of the highest cadmium uptake crop in each food group was used to estimate the increased cadmium uptake in that whole food group. However, as shown by Chaney et al. (1987), lettuce and spinach comprise less than 50 percent of the total dry weight of leafy vegetables consumed per day, and cabbage and other "leafy vegetables" have a much lower cadmium uptake slope. By using the actual amounts of high cadmium uptake crops such as lettuce and spinach, and the uptake slopes for this subset of leafy vegetables, we found that estimated increased dietary cadmium from garden leafy vegetables was only about half the apparent risk estimated by EPA (1979b) (Table 4).

Table 4 also shows the sum of increased cadmium dietary intake if lettuce is increased by 1 μg/g dry weight. The present

Table 3. Comparison of relative increased Cd uptake in the EPA (1979), 1981 EPA draft, Chaney et al. (1987) and present lifetime model for increased dietary Cd intake from home gardens.

Food Group	EPA, 1979	EPA, 1981	Chaney, 1987	1990
	—Teenage Male—		Adult	Lifetime
Relative Food Group Increased Cd Uptake (Lettuce = 1.00):				
Leafy Vegetables	1.00	1.00	0.536	0.536
Potato	0.02	0.02	0.02	0.02
Root Vegetables	0.23	0.23	0.096	0.096
Legume Vegetables	0.04	0.04	0.010	0.010
Garden Fruits	0.17	0.17	0.014	0.014

lifetime diet model estimates about one fifth as high an increase as used in the 1979 regulation. This results from a decline in dietary food intakes between the teenage male from the 1966-1967 U.S. dietary survey, compared to the average lifetime intakes based on the 1977-1978 U.S. dietary survey. It also includes separation of the leafy and root vegetables and garden fruits into high and low cadmium uptake subgroups.

The recommended maximum average daily intake of dietary cadmium is 70 μg/day. Normal U.S. diets average about 20 μg/day for the average lifetime diet. Table 4 shows that if 100 percent of your garden foods were grown on sludge treated soil and if lettuce was increased by 1 μg cadmium/g dry wt., your diet would be increased by 1.67 μg cadmium/day. Very few persons grow 100 percent of their garden vegetables on soils treated with high amounts of sewage sludge for 70 years. Thus, most estimates assume that the worst case might include 33 or 50 percent of home grown garden foods for a lifetime. At 50 percent of garden foods, the diet would be increased by 0.84 μg cadmium/day if the sludge treatment caused lettuce to be increased by 1 μg Cd/g dry wt. Since the allowed maximum average intake of Cd is 70 μg/day, and normal diets contain 20 μg/day, individual dietary Cd could rise 50 μg/day without comprising lifetime risk. At 0.84 μg/day increased garden vegetable Cd, if lettuce were increased by 1 μg Cd/g dry weight, lettuce could be increased over 50 μg/g. This

concentration cannot be attained on sludge treated soils unless very high cadmium concentration, low zinc concentration sludges are applied and soils are very strongly acidic. This is further evidence that the 0.015 Cd:Zn ratio is fully protective of humans, since the lettuce Cd concentration when 25 to 50 percent yield reduction occurs (due to Zn phytotoxicity) is about 10 μg/g dry weight. Baker and Bowers (1988) obtained field data for lettuce from garden soils polluted with Zn and Cd from a zinc smelter. Their results confirm that low Cd:Zn in soils completely protects against ingestion of excessive Cd from garden crops.

Another property of cadmium in foods must also be considered in assessing risk from sludge applied cadmium — bioavailability. Just because one eats increased cadmium in foods grown on sludge amended soils, it doesn't mean that the cadmium will be absorbed by one's intestine equal to cadmium salts added to a diet. Table 5 shows data from a study in which we grew swiss chard (a leafy vegetable like spinach, with high cadmium uptake) using three different sludges and a control. The cadmium in the chard in one treatment was five times higher than that in the control crop. However when this chard was fed for a long period to guinea pigs, there was no change in cadmium in the kidney or the liver of these animals. Why? The answer is bioavailability! Either the chemical species of cadmium in the chard was different between the control and sludge fertilized crops, and/or the high amount of zinc which accompanies the cadmium in the sludge fertilized crops interfered with cadmium absorption in the gut, which led to a zero increase in bioavailable cadmium for the sludge fertilized crop — even when the crop cadmium was increased. Bioavailability always has to be considered in the holistic "Environmental Toxicology."

Table 5. Bioavailability of cadmium in sludge-fertilized Swiss chard fed at 28% of diet to guinea pigs for 80 days (Chaney et al., 1978).

Treatment	Sludge Rate Mg/ha	Soil Cd μg/g	Soil pH	Cd in Chard	Zn in Chard	Cd in Kidney	Cd in Liver
					—μg/g dry weight—		
Control	0	0.04	6.0	0.5	70	14.9a	3.1a
High Metal Sludge	56	0.32	5.7	1.5	950	14.5a	2.7a
Blue Plains Digested	112	0.94	5.5	2.7	580	14.5a	2.7a
Blue Plains Compost	224	0.89	6.6	1.4	257	15.8a	3.9a

UNDERSTANDING CADMIUM TOXICITY

The reason we cared about cadmium so much was because peasant farmers in the Jinzu Valley, Japan were injured by soil cadmium (Friberg et al., 1985). This was first announced to the world in 1969, just about the time research was beginning on sludge metals. FDA was very worried about cadmium at that time. However, fuller understanding always comes with time. We have been able to evaluate the Japanese studies and do other research to interpret those findings. Now we know that cadmium entered rice grain without change in grain zinc in these areas in Japan where mining wastes polluted rice paddies. The soils were high in cadmium (10 μg/g) but also very high in zinc (1200 μg/g). Rice was grown in flooded soils, where zinc was transformed into zinc sulfide in the soil. Cadmium also was transformed into CdS, but CdS was more easily made soluble again when the soil was drained and became aerobic. This rapid oxidation of CdS allowed a high uptake of cadmium into the grain but zinc stayed in the soil.

With other crops in western diets (wheat, lettuce), zinc always accompanies the cadmium into the edible part of the crop. Usually zinc is 100 times higher than cadmium. Further, rice is low in the elements calcium, iron, and zinc — elements which can interfere with cadmium absorption in the human intestine (Fox, 1988). Milling brown rice into white rice removes most of these elements, but removes little of the rice cadmium. Polished rice grain is actually deficient in zinc, iron and calcium for human life. The water in Japan also is low in calcium. These farm families were exposed to excessive rice grain cadmium during the periods of the 1930-1940 depression, World War II, and the post war depression. We now believe that a combination of low calcium, little meat consumption, high cadmium and low calcium, zinc, and iron in rice promoted cadmium absorption in women, and caused a painful bone disease (osteomalacia). Is this relevant to Western persons exposed to sludge cadmium through the crops grown on sludge amended soil? We believe not. Examination of the details of this case help us to understand how the worst case that happened to people in Japan is not relevant to sludge risk assessment.

> In one case, bioavailability of oyster cadmium, coupled with protection afforded by the rest of the Western diet, prevented much increase in cadmium absorption.

Contrasting results were found with a population of people who ate large amounts of cadmium rich oysters during the season in New Zealand (Sharma et al., 1983). Fecal analysis confirmed that one group of these persons were eating on average 250 μg of cadmium per day, a level similar to the amounts ingested by some of the rice eating people that suffered kidney disease in Japan. Instead of having disease from this high amount of oyster cadmium, there was no health effect at all. In fact, the impact of oyster consumption was small compared to the increase due to smoking cigarettes. Five to 15 percent of the cigarette cadmium is volatilized from the burning tobacco into the mainstream smoke, enters the lungs, and is absorbed very efficiently. In Japan, this difference in blood Cd due to smoking was not nearly as important as the effect of the increased supply of rice cadmium. Even when they looked at the kidneys of some of these oyster eaters, there was not even a significant change in cadmium concentration (McKenzie-Parnell and Eynon, 1987). So bioavailability of oyster cadmium, coupled with protection from the rest of the Western diet, prevented much increase in cadmium

absorption.

Our newest research findings about cadmium bioavailability provide even more evidence about food chain protection. This work may eventually provide the explanation for why bioavailability was different between sludge grown crops and crops fed with added cadmium salts. One of my graduate students grew spinach with the same amount of cadmium but with low zinc or high zinc. Nutrient solutions and cadmium isotope were used so we could characterize whether adding zinc along with cadmium had any effect on the chemical forms of cadmium in the crop. In the low zinc spinach, almost all the cadmium was in a soluble form, with a little bit in the form of what we call cadmium binding protein. This is a metal chelating protein (now called phytochelatins) which is produced in plants when they are exposed to high levels of zinc or cadmium. In the high zinc spinach, which simulates a sludge grown crop instead of a cadmium salt grown crop, a much higher part of the total cadmium is in the form of phytochelatin-cadmium. Based on this change in Cd speciation in the high Zn crop, it is not at all unexpected that cadmium in low and high zinc spinach could have very different bioavailability to animals. Intrinsic zinc in the spinach significantly reduced cadmium movement to the kidney of Japanese quail fed the test spinach, while added zinc salt did not decrease cadmium retention (McKenna et al., 1990).

Thus, there are many protections against risk from sludge applied cadmium in the United States. We have used a conservative worst case risk assessment model in which individuals grow a large part of their garden foods on sludge treated soils for their lifetime. And they do everything in the highest risk manner, yet are still protected by the regulations.

However, with the careful estimation of potential increased dietary cadmium due to growing garden vegetables on sludge fertilized soils (for a lifetime; soils always strongly acidic), I feel that risk is overstated. If you meet all the listed criteria to make you the worst case, you are no longer the most sensitive population. If you ate 50 percent of the FDA diet model garden foods from a home garden and grew that garden yourself, you would know about soil pH and never let the soil be strongly acidic for very long. If you didn't maintain soil pH >6.0, and if you were gardening every year for ≥ 50 years, and had used huge amounts of a high metal sludge in your garden, eventually the pH would fall to < 5.5 (due to nitrogen fertilizers) and sensitive crops such as beets, lettuce, and beans would become chlorotic (yellow) in the seedling stage for many years before their yield would be reduced. The gardener would see chlorotic plants and ask the county agricultural extension agent what was wrong. The agent would discover the too acidic soil and remind you of the need for near neutral soil pH for vegetable gardens. Then you would add limestone, raise the soil pH, and stop being the worst case for cadmium risk because your garden is no longer very strongly acidic.

Furthermore, individuals who actually eat model amounts of garden vegetables have a very good diet and are not going to be the nutrient deficient people who are the most sensitive population at the highest risk for dietary cadmium. The very act of becoming the Most Exposed Individual (eating 50 percent of garden foods grown on sludge amended soil) makes you no longer the most sensitive individual (because of improved diet).

PEER REVIEW COMMITTEE

The W-170 Peer Review Committee evaluated the EPA 503 draft regulations very thoroughly, as I noted last year (Chaney, 1989; Page et al., 1989). We think that the most important problems with this regulation happened from misuse or miscollection of data for crop uptake of metals, crop tolerance of metals, livestock accumulation of PCBs, and other transfer slopes. The proposed regulation does not presently have pH control requirements when pH is the most important single factor to control metal transfer and toxicity. Good sludge utilization practice has always been to have pH near 6.5 even though risk may not increase significantly until you go well below pH 6.0.

In the present regulation, there are no sludge constituent concentration or "quality" standards. We believe that because of the plateau response (see Figure 2 in Part I), the amount of metals per unit metal adsorption capacity in the sludge is a very important criterion for sludge regulations. Low metal sludges have been scientifically shown to have lower potential for risk when all the other worst case criteria are met.

In developing the regulations, EPA failed to rely on field demonstrations of no toxicity from sludge applied metals, although they now have agreed to use these results in their revision of the proposed regulations. The 503 proposal used zinc, copper, and nickel phytotoxicity based on pot studies which used soluble metal salts. Because of the adsorption phenomenon in sludge, there is no relationship whatsoever to phytotoxicity risk from sewage sludge applied metals.

In other EPA regulations, a concept the agency calls NOAEL (No Observed Adverse Effect Level) is used. We believe this NOAEL concept should be used in the sludge regulation when field tests have shown no adverse effect even with a pH of 5.5. The limits for metals in the NOAEL sludge appear to be pretty near the "domestic" or median quality sludge that we've described over the years.

The issue of bioavailability comes into the NOAEL risk analysis when we talk about toxicological data from sludge relative to drinking water. Metals in foods, and particularly metals in ingested sludges, are not like metals in water. Lead is a strong example of this. If humans ingest soluble lead acetate during fasting, they absorb about 80 percent

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Pasture Runoff Water Quality from Application of Inorganic and Organic Nitrogen Sources[1]

R. V. MC LEOD AND R. O. HEGG[2]

ABSTRACT

Surface runoff water quality from a fescue pasture receiving surface application of organic wastes and commercial fertilizer was evaluated at Clemson University (Clemson, S.C.). Dairy manure, poultry manure, and municipal sludge were the organic wastes used in this experiment. Ammonium nitrate was the commercial fertilizer. The organic wastes and commercial fertilizer were applied at the rate of 112 kg N ha^{-1} to eight plots during four different periods. Due to an extremely dry year, runoff events were produced by irrigation. The runoff water was collected and samples were analyzed for pH, total P, total suspended solids, total Kjeldahl N, NH_4-N, NO_3-N, and chemical oxygen demand.

The nutrient concentrations in surface runoff were more dependent on the number of rainfalls since application of the fertilizer than on the quantity of rainfall or runoff. The concentrations of potential pollutants from surface-applied organic wastes or commercial fertilizer were reduced by between 80 and 55% after two runoff events. The NO_3-N concentration in the surface runoff from the plots receiving the commercial fertilizer exceeded the permissible public water supply standard during the first runoff event. The overall nutrient loss in the runoff was found to be minimal (< 4% of total Kjeldahl N and chemical oxygen demand and < 2.5% of total P).

Additional Index Words: animal manure, municipal sludge, water pollution, runoff water quality, runoff.

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After an organic waste has been applied to a soil, some of the waste may be transported by rainfall runoff, snowmelt, or irrigation runoff into surface waters. During an intense August storm, little sediment and few nutrients were removed from land application of dairy manure, as reported by Zwerman et al. (1972). Baker (1980) found that average concentrations of NH_4-N and NO_3-N in surface runoff were not greatly affected by the level of N fertilization. He did report that N fertilization can increase the levels of NH_4-N and NO_3-N in individual runoff events, if it occurs shortly after surface application with minimal fertilizer incorporation. Doyle et al. (1975) applied 90 Mg of dairy manure/ha, which resulted in elevated levels of N, P, K, and Na in runoff water from the treated area. The concentrations of these nutrients were dependent on the number of rainfall events previously leaching the manure, but was independent of the total rainfall and the amount of runoff collected.

Measured N loss in drainage water from two steeply sloping, fertilized grassed watersheds was found to be modest over a 4-y period, ranging from 6 to 10% of that applied in fertilizer. Furthermore, annual P losses were negligible, amounting to 0.15 and 0.27 kg ha^{-1} on the two watersheds (Kilmer et al., 1974). In an experiment comparing fertilizer treatments with sewage sludge treatments, Dunigan and Dick (1980) found that the fertilizer treatments resulted in slightly higher runoff losses of total soluble N. The fertilizer treatments had a total loss of 0.80 kg N ha^{-1}, whereas the sludge treatment total loss was 0.68 kg N ha^{-1}, despite the fact that more N was added in the sewage sludge treatments. They also found that the fertilizer treatments produced a consistently higher concentration of nutrients in the runoff water than did the sewage sludge treatments. Other investigators have also shown the same low nutrient losses associated with surface runoff from lands treated with organic wastes (Clapp et al., 1977; McColl, 1979; Reese et al., 1982).

The environmental impact of land application of organic wastes and N fertilizer was investigated. The primary objectives of this research were: (i) to determine surface runoff water quality from a fescue (*Festuca* spp.) pasture receiving four N sources; the treatments were dairy manure, poultry manure, municipal sludge, and ammonium nitrate; and (ii) to determine the loss of nutrients and solids from a runoff event as a function of time since application.

MATERIAL AND METHODS

This field study was conducted on eight 0.012-ha plots located on a Clemson University (Clemson, S.C.) dairy pasture. The slopes, infiltration rates, and density of vegetative cover varied slightly from plot to plot. To alleviate this variability, a cross-over design with a blocking factor (four application periods, 4 weeks per period) was used in this experiment (Federer, 1955). During the four application periods, each plot received all four treatments of N. Each treatment was replicated twice during each application period to give a total of 32 observations with 16 degrees of freedom for the experimental error.

The eight bordered plots were 6.10 m wide by 20.12 m long with slopes of 3 to 5%. The border around the plots was a clay berm about 15 cm high. This ensured that the surface runoff measured came entirely from the individual plots. The soil was a red clayey Cecil (Clayey, kaolinitic, thermic typic Hapludults) and the vegetative cover was primarily tall 'Kentucky 31' fescue (*Festuca arundinacea* L. Shreb) with some ladino clover (*Trifolium repens* L.). No measurements were made of the grass growth during the study. The experimental plots were accessible to dairy heifers kept in the pasture at a stocking rate of less than one animal per hectare. Therefore, the presence of the heifers had a minimal affect on this experiment.

The plots were designed to collect surface runoff by means of a perforated, plastic drainage pipe. The collection (drainage) pipe was laid in a trench perpendicular to the slope of the plots (Fig. 1) and was covered with gravel. The runoff water from the collection pipe was routed by solid piping to a splitter. The splitter was designed to allow approximately 10% of the total surface runoff to collect in a 208-L barrel. The overall collection efficiency for each plot was determined by calibrating the efficiency of each collector pipe and each splitter. These efficiencies were used to determine the actual runoff volume.

The dairy manure was collected from a concrete flush floor at the Clemson University dairy farm. This manure was < 24 h old when collected, weighed, and spread on the runoff plots. The poultry manure was collected from a caged layer house of a private producer and was from 1 to 4 months old. The dried municipal sludge came from the waste treatment plant at Seneca, S.C. Analyses were conducted on samples collected during the application of the three organic wastes. The three organic wastes were applied uniformly, by shovel, to their appropriate runoff plots. The NH_4NO_3 was applied by hand.

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without cumulative metal application limits. Pathogen waiting periods would still be required unless sludges are treated to kill pathogens. This method of regulation would allow cities that want to clean up their sludge to have a much easier sludge application program than the present regulations allow. There will still be a need for N-fertilizer application rate limits, erosion control, and all the other proven management practices for sludge utilization, but it has the potential of greatly reducing the hassle and record keeping requirements of current regulatory programs — and of better communicating to the public that, with adequate industrial pretreatment, sludge utilization in agriculture is a safe practice.

If we research the fundamental biochemistry and human physiology for these toxic metal questions involved with sludge utilization, we come up with more and more support for the conclusion that low metal sludges are extremely safe when used in agriculture as a fertilizer and soil conditioner resource. These sludges can be used in ways that do not risk the environment or the food chain. We can call it a valuable resource and we should be maintaining our efforts to recycle and use this material beneficially. I hope that the revision of the 503 regulations — taking into account the scientific flaws identified by the Peer Review Committee — will lead to the better regulations that cities and farmers need to solve this important national problem. ■

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Table 8. Composition of a sludge which could be applied at cumulative loadings of at least 1000 Mg/ha yet not fail the Pathway Risk Assessment which protects Most Exposed Individuals.

Pollutant	Proposed NOAEL Sludge Limit	Comparison with the 1990 Nat. Sewage Sludge Survey: Normal Statistics Median	Normal Statistics 95th	Normal Statistics 98th	Maximum Likelihood[4] Median	Maximum Likelihood[4] 98th
	mg/kg DW			—mg/kg dry sludge—		
As	100[1]	6	43	62	5	33
Cd	18	7	21	25	4	19
Cr	2000[1,2]	40	635	1960	39	409
Cu	1200	463	1940	2490	456	2180
Hg	15[3]	4	17	43	2	19
Mo	35[3]	11	42	56	5	32
Ni	500	29	223	438	18	159
Pb	300	108	298	444	76	373
Se	32	5	28	51	3	18
Zn	2700	725	4100	4760	755	3270
PCB-1248	2.13	0.21	0.67	1.5	0.02	0.21

[1] *Adjusted downward for pretreatment considerations.*
[2] *No adverse effects reported for any Cr^{3+} level in municipal sludge.*
[3] *Valid for all sludge uses except mushroom production.*
[4] *Mo limit raised because Mo slowly leaches from alkaline soil.*
[4] *Maximum Likelihood Estimation Procedure, assuming multicensored lognormality.*

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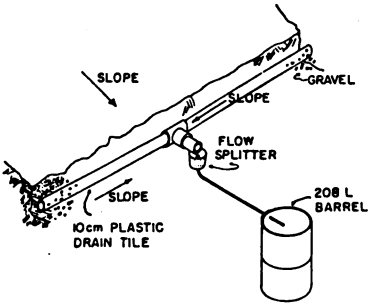

Fig. 1—Surface runoff collection system.

To ensure collection of adequate data during an extremely dry summer, runoff events were produced by irrigation. Each plot was irrigated 1 d/week for 4 weeks, beginning 1 d after application with water from a lake located approximately 183 m from the experimental plots. By trial and error experimentation, it was found that uniform coverage of the plots was achieved at 276 kPa using eight spray heads per plot (Rain Bird 2600) to produce a rainfall of 3.65 cm h^{-1}. A rate of 112 kg ha^{-1} of total Kjeldahl N (TKN) was chosen in this experiment (Table 1), based on recommended annual maintenance rate for N suggested by the Clemson University Cooperative Extension Service for fescue pastures. The primary objective of this experiment was to evaluate the quality of the runoff water following application. Therefore, four applications were made during the experimental period recognizing that the total N applied would be approximately four times the recommended rate.

After a runoff event, the depth of runoff in each collection barrel was measured so that the actual surface runoff could be calculated using the collection efficiency for each plot. The collected runoff in each barrel was thoroughly mixed so that a representative sample (1000 mL) could be extracted. All samples collected after each runoff event were analyzed according to procedures described in APHA (1975). The samples were analyzed for pH, total suspended solids (TS), total P (TP), chemical oxygen demand (COD), TKN, NH_4-N, and NO_3-N. Soil samples at depths of 15 and 30 cm were obtained from the plots before and after the experiment for N analysis.

RESULTS AND DISCUSSION

Application

The characteristics of the organic wastes for the four application periods are shown in Table 2. The dairy manure was much fresher (179 g kg^{-1} dry mater) than the poultry manure (494 g kg^{-1} dry matter) or the municipal sludge (539 g kg^{-1} dry matter). Of particular note is the large variation in the organic waste concentrations for each application period. This variation caused the N application rates to fluctuate above and below the target value of 112 kg N ha^{-1}.

All background concentrations of nutrients in the runoff water from the Clemson University pasture were very low as expected from an unfertilized and unmanured pasture and would offer little pollution potential (Table 3). The effect of Lake Hartwell water on the surface runoff nutrient concentrations was minimal.

Table 1—Application rates for four sources of N.

Application date	Treatment	Dry matter application rate	Nitrogen application rate
		Mg ha^{-1}	kg ha^{-1}
15 June	Ammonium nitrate	0.33	112
	Dairy manure	34.0	113
	Poultry manure	8.9	113
	Municipal sludge	4.5	114
13 July	Ammonium nitrate	0.33	112
	Dairy manure	34.0	171
	Poultry manure	9.8	289
	Municipal sludge	16.5	225
10 August	Ammonium nitrate	0.33	112
	Dairy manure	22.5	131
	Poultry manure	3.5	98
	Municipal sludge	7.9	108
8 September	Ammonium nitrate	0.33	112
	Dairy manure	22.7	108
	Poultry manure	2.5	85
	Municipal sludge	11.3	121

Table 2—Organic waste characterization for the four application periods.

Treatment	Period	Variable				
		TKN	NH_4-N	TP	COD × 10^4	TS × 10^4†
		mg kg^{-1}				
Dairy manure	1	3 332	370	1 720	129.0	125.8
	2	5 040	599	8 400	120.6	190.3
	3	5 846	1 036	2 150	163.7	220.7
	4	4 760	840	7 800	137.5	179.8
Poultry manure	1	12 672	5 488	11 800	171.6	258.2
	2	29 452	7 182	15 250	269.2	597.8
	3	25 480	6 360	10 500	160.0	517.4
	4	29 904	4 424	15 600	351.1	607.0
Municipal sludge	1	25 480	2 520	9 300	772.1	549.3
	2	14 553	756	6 150	346.9	455.1
	3	13 940	1 750	7 300	324.9	464.6
	4	10 696	756	4 800	193.6	366.5

† Dairy and poultry TS values were estimated using TKN/TS ratios from previous unpublished research by R. O. Hegg; the sludge TS values were estimated from TKN/TS ratios from Metcalf and Eddy (1979).

Table 3—Background runoff and lake water characteristics.

Parameter	pH	Variable					
		TKN	NH_4-N	NO_3-N	TP	COD	TS
		mg/L					
Background data†	6.20	–	0.03	0.08	0.28	41.7	25.0
Lake Hartwell	8.40	3.02	0.45	0.17	trace	trace	0.50

† The above values are the means of runoff from storm events collected over a 6-month period (Reese et al., 1982).

During the period this research was conducted, no natural runoff events occurred. All runoff events were produced by irrigation. The period of time that water was applied to the plots was controlled by the time required to collect an adequate volume of runoff water in the collection barrel. The length of irrigation time varied from plot to plot, depending on the characteristics of each plot. The nutrient concentrations in the runoff are presented in Fig. 2 through 7. Each data point represents a mean generated from the four application periods and the duplicate plots, or a total of eight observations. This procedure would negate the effect of

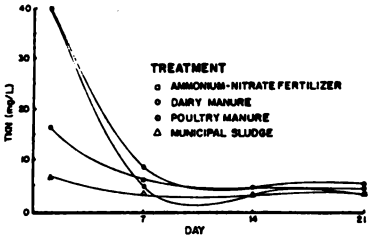

Fig. 2—Concentration of TKN in runoff water at weekly intervals following an initial application.

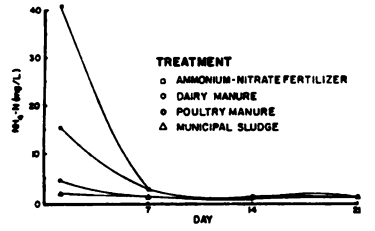

Fig. 3—Concentration of NH_4-N in runoff water at weekly intervals following an initial application.

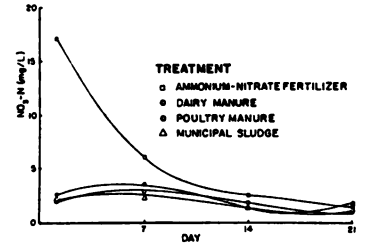

Fig. 4—Concentration of NO_3-N in runoff water at weekly intervals following an initial application.

changes in vegetation during the course of the experiment. The mean data points were plotted at weekly intervals which correspond with the irrigation schedule.

The grass was not cut during the experiment (15 June-1 October). By visual inspection, the grass growth was uniform from plot to plot.

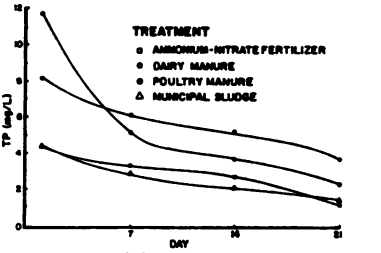

Fig. 5—Concentration of TP in runoff water at weekly intervals following an initial application.

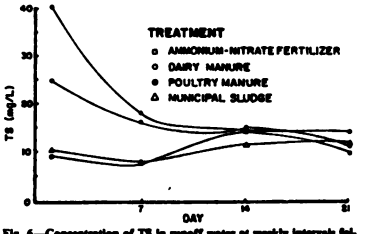

Fig. 6—Concentration of TS in runoff water at weekly intervals following an initial application.

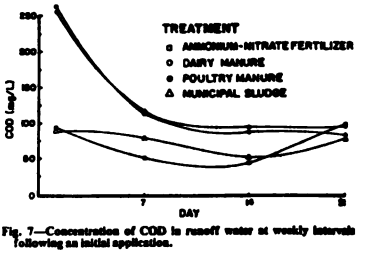

Fig. 7—Concentration of COD in runoff water at weekly intervals following an initial application.

Water Quality

Poultry manure and the NH_4NO_3 fertilizer produced a higher initial concentration of TKN in the surface runoff water than did the municipal sludge or the dairy manure (Fig. 2). For all treatments, TKN concentrations leveled out after the second runoff period (day 7). Westerman and Overcash (1980) reported that concen-

trations of potential pollutants from surface-applied swine and poultry waste were reduced by 90% within 3 d. A similar result was found in this study. The TKN concentration dropped 88% between the first and second runoff events for the NH_4NO_3 and 79% for the poultry manure. Ammonium nitrate and poultry manure TKN concentrations were not significantly different[1] during the first runoff period; however, both were significantly different from either the dairy manure or the municipal sludge. On the second runoff period the poultry manure produced the highest TKN concentration (8.44 mg/L), which was significantly different from the other three treatments. After the second runoff event, the dairy and poultry manure TKN concentrations were not significantly different, and the NH_4NO_3 and the sludge concentrations were not significantly different, but both pairs of treatments were significantly different from each other.

As expected, the NH_4NO_3 treatment produced a higher initial concentration of NH_4-N and NO_3-N in the runoff water than the other three treatments of N (Fig. 3 and 4). The statistical analysis revealed that the NH_4NO_3 treatment was significantly different than the other three treatments for both NH_4-N and NO_3-N concentrations for the first runoff period. This initial concentration of approximately 17 mg/L NO_3-N was higher than the permissible drinking water supply standard of 10 mg/L. For the NH_4-N runoff concentration during the second runoff period, the NH_4NO_3 treatment was not significantly different from the poultry manure; and the dairy manure was not significantly different from the municipal sludge. However, both pairs of treatments were significantly different from each other. The only significant difference between treatments for the runoff NO_3-N concentrations during the second runoff period occurred between the NH_4NO_3 and the municipal sludge. After day 7, there was no significant difference between any of the four treatments for neither NO_3-N nor NH_4-N runoff concentrations. A 94% reduction and an 84% reduction were noted in the NH_4-N concentrations for the NH_4NO_3 and poultry manure treatments between the first and second runoff events, respectively. The NO_3-N runoff concentration for the commercial fertilizer was reduced by 65% in two runoff events.

The pH values ranged between 6.2 and 6.5 in the surface runoff water for all treatments during the four runoff events, except for the NH_4NO_3 treatment, which dropped to 5.6 during the second runoff period. This was the only statistical significant difference in pH during the entire experiment.

Figure 5 shows that the poultry manure produced the highest initial TP concentration in the runoff water. After the first runoff period, the highest TP concentration was produced by dairy manure. Since the background levels and Lake Hartwell samples of TP concentration were very low, the only explanation for the higher TP concentrations from the NH_4NO_3 treatment was a carryover effect from the other three treatments. Only a 56% reduction was noted between day 1 and 7 for the poultry manure TP concentration. There was no significant difference between TP in the runoff for the poultry manure and the dairy manure for the four runoff periods. This same observation was found to be true for the NH_4NO_3 and municipal sludge treatments, although the TP in the poultry and dairy was significantly higher than the NH_4NO_3 and municipal sludge.

The dairy manure showed the highest initial TS concentration in the runoff water; the second highest concentration was from the poultry manure, which was already at the reported background level (Fig. 6). These two organic wastes should be readily broken down by the impact of the water droplets, thereby contributing more solids to the surface runoff. The slight increase in TS concentration for both the municipal sludge and the ammonium nitrate treatments after day 7 was probably due to variation in samples. The only significant difference in treatments was during the first runoff event, where the dairy and poultry manure TS concentrations were significantly higher than the municipal sludge and the NH_4NO_3 treatment TS concentrations. Once again, the leveling out effect was seen after the second runoff period, and a 55% reduction in TS concentration was noted for the dairy manure during the second runoff event.

The COD concentrations in the runoff water for the dairy and poultry manure were nearly the same (Fig. 7). They both produced the highest initial COD concentration of the four treatments, and no significant difference was reported between the two during the four runoff events. The poultry and dairy manure runoff had a 57 and 54% reduction, respectively, in COD concentration by day 7. The COD concentrations for the NH_4NO_3 and municipal sludge showed no significant difference during any of the runoff events, and any fluctuation in COD concentrations was due to sample variation.

Mass Balance

The nutrient loss (on a mass basis) of N for a runoff event followed a similar pattern to the nutrient concentrations in the surface runoff. For this reason graphs are not included. The lowest initial loss of TKN was reported for the municipal sludge and the dairy manure. The highest initial loss came from the poultry manure and the NH_4NO_3. There was no significant difference in N loss between any of the treatments after the second runoff period.

The commercial fertilizer produced the highest initial loss for both NH_4-N and NO_3-N. There were no significant differences from NH_4-N loss for the NH_4NO_3 nor poultry manure during the first and second runoff periods. After the second runoff period, no significant difference existed for any of the treatments. The loss of NO_3-N was significantly higher for the NH_4NO_3 treatment than for any other treatment during day 1 and 7. After the second runoff period, no significant difference was reported for NO_3-N loss for any of the treatments.

A summary of the overall loss of nutrients in the runoff water is presented in Table 4. The total nutrient loss

[1] All tests for significance in this report were made at the 95% confidence level.

Table 4—Total nutrient removal by surface runoff.

Treatment	Variable	Mean application rate	Total nutrient loss	Loss in runoff‡
		kg ha⁻¹		%
Ammonium nitrate	TKN	–	4.5	–
	NH_4-N	56	4.0	7.1
	NO_3-N	56	2.2	3.9
	TP	–	1.0	–
	COD	–	94.4	–
	TS	–	4.2	–
Dairy manure	TKN	131	2.3	1.8
	NH_4-N	39	0.5	2.5
	NO_3-N	1.7	0.5	29.4
	TP	142	1.8	1.3
	COD	3900	43.0	1.1
	TS	5070†	7.9	0.2
Poultry manure	TKN	146	5.6	3.8
	NH_4-N	37	1.8	4.9
	NO_3-N	2.4	0.7	20.6
	TP	86	2.0	2.4
	COD	1520	54.0	3.6
	TS	3280†	7.6	0.2
Municipal sludge	TKN	412	1.3	0.9
	NH_4-N	14	0.3	2.1
	NO_3-N	2	0.4	20.0
	TP	67	0.8	1.2
	COD	4908	28.0	0.7
	TS	5280†	3.8	0.1

† Estimated.
‡ Mean loss per application for four runoff events.

for each variable was extremely low, and the percent loss in the runoff water can be considered minimal. The application rates of NO_3-N from the organic wastes were very low; therefore, the high percent loss for NO_3-N in the runoff water was likely due to nitrification in the soil.

The soil on each plot was analyzed (TKN, NH_4-N, and NO_3-N) at the 15.2 and 30.5 cm depths prior to (May 1981) and after the experiment (October 1981). The values ranged from 3.1 to 10.5 before and 2.2 to 6.2 after for TKN; 2.6 to 5.3 before and 1.3 to 2.6 after for NH_4-N; and 0.54 to 1.80 before and 0.25 to 1.04 after for NO_3-N (all values as mg kg^{-1} on a dry-matter basis). This means that there was a slight decrease in the soil N values during the study even though approximately 450 kg N ha^{-1} was added to each plot. Because grass yields were not determined, no estimate can be made of the amount of N in the fescue. There would have been some loss of N as NH_3-N as the organic wastes were spread out on the plots and wetted with the irrigation water. Some N could have been removed by denitrification because suitable conditions (anaerobic conditions from the saturated soil and an organic C source from the applied wastes) existed on the experimental plots. Removal of the N by leaching was also likely because of the permeable soils and high irrigation rates (3.65 cm h^{-1}).

CONCLUSIONS

Four different sources of N were applied to pasture plots in a cross-over design with a blocking factor. Runoff was produced by irrigation at weekly intervals after application. The research resulted in the following conclusions:

1) The major factor influencing the concentration of potential pollutants in runoff from soils receiving a surface application of organic wastes or commercial fertilizer was the number of rainfalls following application.

2) Application of NH_4NO_3 at a rate of 112 kg N ha^{-1} produced a NO_3-N concentration in surface runoff above permissible public water supply standards of 10 mg/L during the first runoff period (1 d after application).

3) Runoff from plots receiving a surface application of municipal sludge exhibited the least overall potential for pollution when compared with the dairy and poultry manure or to the commercial fertilizer.

4) Concentrations of potential pollutants in runoff samples collected from plots receiving organic wastes or commercial fertilizer were reduced on an average of 80% for the N forms and by 55% for the TP, TS, and COD constituents after two runoff events.

5) The overall nutrient loss was minimal (< 4% of TKN and COD and < 2.5% of TP) in surface runoff from a fescue pasture receiving surface application of dairy manure, poultry manure, municipal sludge, and NH_4NO_3.

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ATTACHMENT 2

Projects Reports

TULSA WORLD
MONDAY, APRIL 4, 1983

FARM

Sludge Used for Fertilizer

By MARK LEE
World Farm Editor

BIXBY — Grass grower Ray Volentine has discovered how area farmers can have free fertilizer delivered to their farms, courtesy of the City of Tulsa.

The only catch, he said, is people are sometimes spooked when they hear what it is.

"Mention municiple sewage and people think, 'Yuck,'" Volentine said. "But I've been trying to get Tulsa to give me its sewage sludge for years."

Volentine owns and operates Tulsa Grass and Sod Farm north of the Arkansas River and east of Memorial Drive. He first saw municiple sewage sludge used on turf grass five years ago in Washington. Every year since, he's asked the Tulsa Water and Sewer Department to give him some of the thick, black, oderless stuff but was refused until this year.

"They said no because there were too many city and county health laws to comply with. They won't release their sludge to just anyone to dispose of, because legally, the city is ultimatly responsible for its waste," Volentine said. "The city didn't want it used incorrectly."

Enter Bio Gro Systems, Inc., of Annapolis, Md. When Tulsa's sludge storage lagoons recently began to fill up and interfere with efficient sewage treatment, Bio Gro bid for and won a contract with the city to empty some of the lagoons.

Cities pay Bio Gro to clean out sludge lagoons and dispose of the stuff somewhere, said Gary Macmann, Bio Gro project manager, Tulsa. Macmann likes to spread it on farmers' fields.

"We've been at this in Oklahoma for a year and three months," Macmann said. "We've already spread a lot of Oklahoma City sludge on farms in that area. But when the state health department first heard what we were planning to do, they were stunned. 'You're going to do what?' they asked," Macmann said. "They weren't up on the latest research, proving how sludge can be safely used."

Sewage sludge is the solid material left over from raw sewage treatment. Spread correctly and in the proper amounts for each soil type, some varieties of sewage sludge are harmless to soil and the humans or animals that may eat plants grown in the soil. Macmann's firm has the equipment, men and expertise to meet all health requirements and safely dispose of sludge, he said.

"I think much of the aversion people have to using sludge on crops comes from Asia. People visiting there see raw human waste put on food crops, and military personnel are forbidden to eat local fruits and vegetables because of the risk of disease," Macmann said.

"The stuff we're spreading here is fully processed and is actually about seven years old. It's nothing like raw sewage."

The sludge spread on Volentine's sod farm recently had no detectable odor. The material had about a 90 percent water content and was sprayed over a plowed field. A tractor and disc stirred the sludge into the soil. After that, the application couldn't be seen or smelled.

"The major nutrient in this sludge is nitrogen, and it's in a slow-release form that should help my grass grow better," Volentine said. "But just as important, sludge will add water holding capacity and organic matter to my soil, a sandy loam."

"That's important. Every time I harvest sod I remove a little of my topsoil with it. If I never put anything back, eventually I'd be in trouble," Volentine said.

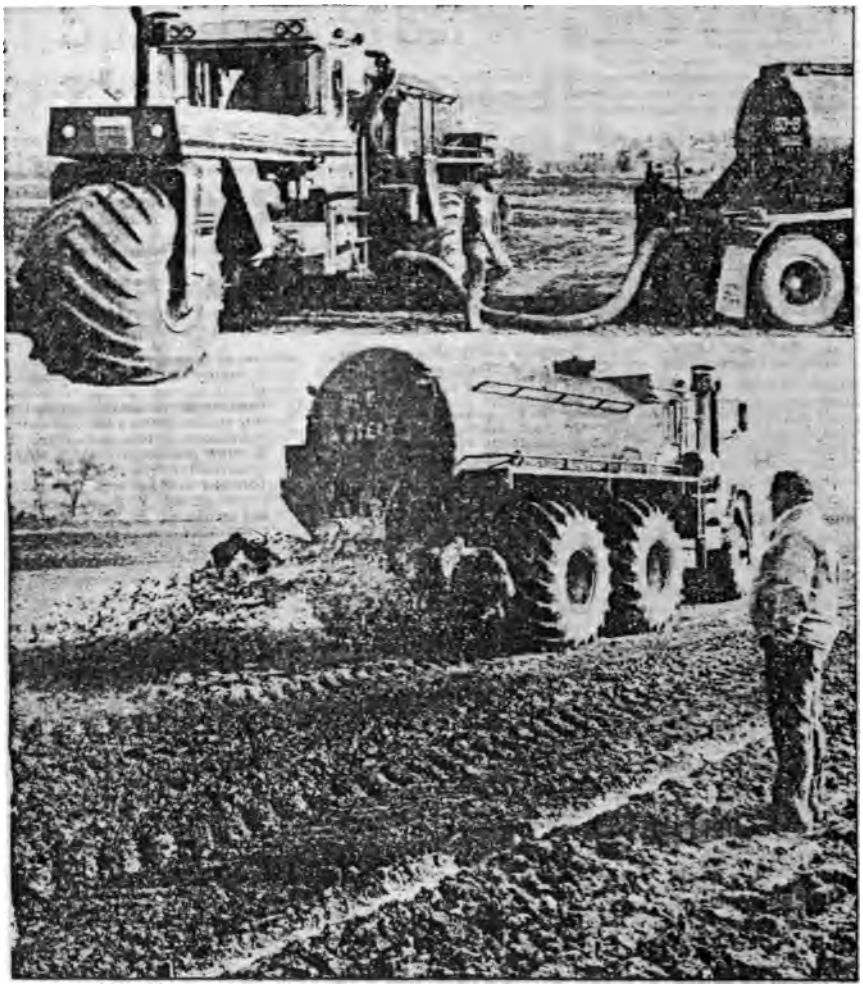
After consulting with Randal Beeson, a scientist friend who helps mining companies reclaim mined-over land, Volentine said the sludge should cut his fertilizer cost in half this year. He also expects to be able to use less irrigation water or to get a greater response from the irrigation he uses.

"All I had to do was sign some consent forms" Volentine said. "Macmann came out to test the soil and check the crop to determine application rates. Then the city-county health department inspected the site just to double check. Macmann then delivered and spread the stuff."

Beeson said Tulsa sludge is low in cadmium, a metal which can be a health hazard if it gets into the food supply. Regulations allow application only on agronomic or ornamental crops — no vegetables — and only on soil with a pH of 6.5 or higher. A lower pH (more acid soil) could allow cadmium to become chemically active and be taken up into crops.

Macmann said his firm was still interested in finding more local farmers who'd like a few loads of free sludge fertilizer. The number of his Tulsa office is 446-0714.

"I feel good about my work," Macmann said. "This fits with the natural order of things. We're taking a waste disposal problem and turning it into something good for the land. And sludge is a renewable resource, you know."



World Staff Photos

A large tank truck (top photo, above) carries Tulsa sewer sludge from a treatment plant to a waiting fertilizer spreader. Sod farmer Ray Volentine (lower photo) watches as the spreader rig sprays sludge on his grass farm near Bixby. Volentine stands where the sludge has already been disced into the soil.

THE ULTIMATE RECYCLING PROJECT

Sludge—what's left over after wastewater treatment—makes Maryland farms grow green.

by JANE KLEMER

It may be the ultimate in recycling—waste materials from sewage are plowed into the soil of farms, increasing agricultural productivity and disposing of unwanted sludge at the same time.

In an era fraught with possibly insoluble environmental problems like acid rain, the greenhouse effect, and water pollution, the disposal of sludge from wastewater treatment plants is one problem that can be resolved in a way that is good for the environment. Around Washington, D.C., a consortium of local and state governments, private industry, and farmers are making this ultimate recycling effort work.

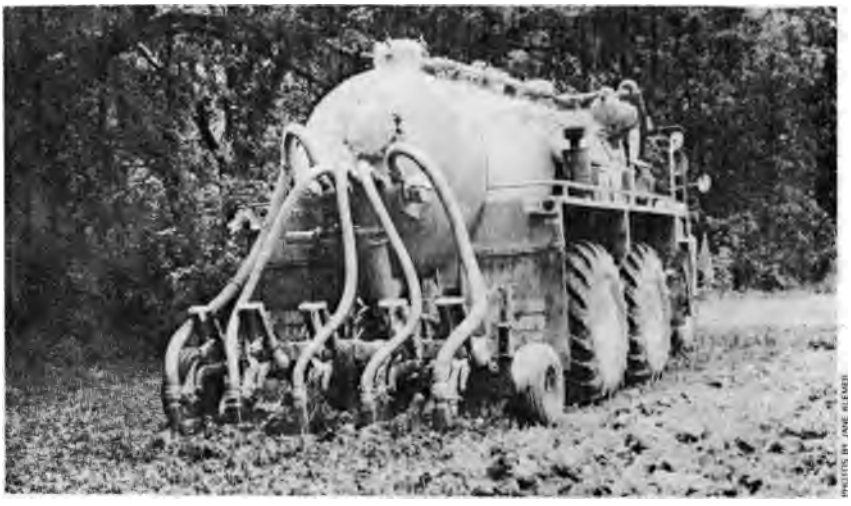
"What we're putting back into the land is us!" says Mike Realo of Bio Gro Systems, Inc., a private firm specializing in the land application of sludge. Sludge is what is left over after wastewater is treated. The Blue Plains wastewater treatment plant on the Anacostia River was built in 1934 by the Roosevelt administration to prevent the pollution of the Potomac River. Now this greatly expanded and more efficient plant can treat more than 309 million gallons of wastewater per day. In the process the plant generates 2,000 tons of sludge per day, 97 to 99 percent of which is water. After being purified, the water goes into the Potomac. The solids, though, are a potentially rich source of nutrients for area farms.

Bill Coates walks as sludge is pumped through a six-inch-diameter hose into one of the huge Terragators.

Nobody wants sludge except farmers, who are beginning to realize its potential to improve the soil.

It has been estimated that each year the United States generates about 8.5 million tons (dry weight) of municipal sewage sludge. Traditionally organic wastes have been put in landfills (especially in strip-mined areas), dumped in the ocean, burned, or stored in lagoons. Many other parts of the world have, for centuries, used effluent on farm land. In Asia, Europe, and Australia, for instance, human, animal, and plant wastes have long been used to restore and maintain the productivity of the soil. But the practice has been slow to catch on in this country. And rightly so, since the technology to process sewage and reduce the risk of contamination has only recently been developed.

Land application means using sludge on farms to provide nutrients for crop growth and to increase organic matter in the soil. In this country the possibility of using sewage sludge was studied in the late 1960s by Tennessee Valley Authority scientists.



Looking like a cross between a tractor and a tricycle, a Terragator (top) holds 13 tons of sludge. At work (above), the Terragator shoots sludge through its tubes while turning over the dirt.

as part of a joint TVA-Public Health Service windrow composting project at Johnson City, Tenn.

Closer to home, at the Department of Agriculture facility in Beltsville, Md., experiments conducted in the 1970s showed that one dry ton of sludge produced the same yield response as 14 dollars worth of commercial fertilizer.

Although on a national average about 60 percent of sludge is recycled, the *total output* of Blue Plains goes into recycling; every pound of sludge goes back to nature—either by composting or land application. The motivation was environmental, economic, and, in some ways, accidental, for a shortage of money—plus the stringency of environmental standards—some years back made it impossible for the facility to build a planned incinerator. Officials had to think of another way to get rid of the sludge.

At the core of the solution is a successful working relationship between bureaucracy and private enterprise. Mike Realo of Bio Gro Systems, the private contractor, refers to the entire process as a "people-oriented solution with a simple technology geared toward solving a city's sewage problem."

Admittedly, the land application of sludge has had its detractors and has met with opposition from concerned citizens about the safety of the method. For example, while organic wastes may be valuable sources of essential nutrients and organic matter; they cannot be applied to the land indiscriminately, for if they have been generated in areas serving industry, they may contain harmful levels of toxic chemicals. Another concern is the contamination of productive farmlands by tainted sludge. Research has established safe measures for dealing with sludge, so that now enlightened farmers on the Eastern Shore and in Prince Georges, Anne Arundel, and Charles counties who have hopped on the bandwagon and had their fields treated with sludge are enjoying very positive results.

Jack Burbank, a Bio Gro Systems employee, was the field manager for work at the National Colonial Farm and the adjacent Hard Bargain Farm on the Potomac River in Accokeek, Md. Burbank majored in business administration in college, but his primary background is in farming. "We operate like an army," he says. "Everybody knows his job; there's

no fumbling or standing around." And, indeed, an observer is immediately struck by the efficiency of the entire operation. Once a day's work is underway it seems there would be no way to stop the process. It's like the relentless activity of the water-carrying broomsticks in Walt Disney's *Fantasia*.

The men begin their warm-weather workdays at 5:00 a.m. at the Blue Plains plant. Tank trucks (referred to as "catch trucks") operated by the Bevard Brothers Company transport the sludge. These 25-ton trucks are among the largest tankers on the road today.

Bio Gro's Terragators inject the sludge into the ground. The Terragators—two for this job—have tricycle-truck front ends with huge flotation tires. Each "gator" is powered by a 900 hp Cummings diesel engine. Its holding tank carries 13 tons of sludge. At the back of the vehicle are five hollow shanks (operated hydraulically from the cab) that, when switched to "Pressure," force the sludge into the ground.

First workers connect a six-inch-diameter hose between the tanker and the Terragator. The sludge, which is about the consistency of freshly produced cow manure, is sucked from one vehicle into the other. Water is mixed in to make it flow more easily.

The transfer procedure takes about eight minutes if both gators are on hand to receive the entire contents of a tanker. The empty truck immediately deadheads back to Blue Plains for another load.

As the behemoth Terragators roll up and down the fields, they inject the sludge and disk the top layer of dirt at the same time. All fields treated during the course of any given workday must be disked and raked by quitting time to make certain that nothing remains on the surface. This final procedure is usually accomplished by about 5:30 p.m., a full 12 hours after the day's activities got underway.

The huge Terragators are considered farm equipment, and if the next job on the schedule is not too distant, they make their escorted way under their own power via highway, at a top speed of 30 mph. Jack Burbank says that a man can be trained to drive a gator in a day, if he has been used to driving heavy equipment, but that it takes months to become a first-class operator.

Not all of the Blue Plains output finds its way into land application by Bio Gro. A sizeable percentage goes into a composting program,

The organic matter in sludge increases the water-holding capability of the soil, which reduces runoff to the Bay.

the system for which was developed by the United States Department of Agriculture in the early 1970s. The technology developed in Maryland is now utilized throughout the United States. In our own area composted sludge is marketed by the Washington Suburban Sanitary Commission (WSSC) under the brand name "Compro." They sell all they produce. The process is twice as costly as land application, however.

Advocates for recycling waste materials from sewage—be it via land application or composting—find something inspiring about the process. The major reason Realo, Burbank, and others came to Bio Gro is that they believe one of the most effective solutions to our environmental problems is very low technology resource recovery.

There is no doubt that treated and stabilized sludge from municipalities can be safely, beneficially, and economically utilized as a fertilizer-soil conditioner. Sludge is a *major* resource and, so far, it is available to farmers free for the asking. The organic matter in the sludge improves the physical, chemical, and biologic properties of the surface soil, while reducing fertilizer needs (and costs). The material is composed of humus, nitrogen, phosphorus and smaller amounts of potassium and other trace metals. The only nutrient lacking is potash; supplementary application of potash costs about ten dollars per acre.

The substance plays an important role in the maintenance of soil productivity; it increases crop yield. It also increases the water-holding capability of the soil, an important consideration when we are trying to reduce runoff to the Bay.

Farming's not for those who must have instant gratification. It takes a full growing season to see the results of planting and nurturing. The dormant land continues to digest a feeding throughout the winter.

The Bio Gro team worked at National Colonial Farm during the summer of 1987 for a total of about four days, preparing 34 acres. Their stay at Hard Bargain totaled about 15 days; here they injected in excess of 60 acres. Neither farm is privately owned; both are operated as educational centers.

Springtime rains were ample and Eileen Watts, assistant farmer at Hard Bargain Farm, reported an exceptionally good first cutting of hay on treated land in the spring of 1988. Although a wheat field adjacent to the aforementioned hay acreage had not been treated, the wheat nearest the treated field grew twice as tall as that on the far side of the same field, thanks to nutrients travelling underground from the treated field.

George Garner, who lives nearby, also participated in the sludge application program on his farm. He reported a first cutting of alfalfa (which was a "nice, deep green color") twice the quantity of pre-treatment times. Watts stated further that corn planted on treated land seemed to get off to a faster start than untreated corn, but the drought of 1988 ultimately took its toll on both areas.

Another bonus is that the staff at Hard Bargain was saved weeks of work preparing the fields for planting that season—fields that were badly in need of regeneration. Some were heavily compacted. One was analyzed as 83.6 percent sand—"little better than a beach."

Jack Burbank, the Bio Gro manager, is pleased with the results of the project. "Even a casual observer can tell immediately where the buffer zones [untreated areas] are," he says. With normal rainfall, the injected areas should flourish. He warns, "They'll be the greenest green you've ever seen." □

Jane Klemer is a freelance writer whose work has appeared in Equus, Early American Life, *and several local publications. She wrote about osprey researcher Steve Cardano in the June issue of* Chesapeake Bay Magazine.

TECHNICAL REPORT DATA
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16. ABSTRACT

The objective was to demonstrate sludge application systems for farmland that would minimize any adverse effects on the environment and public health, achieve both urban and rural acceptance, and be generally beneficial for producer and receptor of the sludge. A comprehensive health effects study of the families living on sludge-receiving farms was conducted. Health status of residents of 47 sludge-using farms were compared with 46 control farms. Neither incidence of disease, nor evidence of viral infections differed significantly between sludge-using and control farms. Neither was the health of livestock found to be different between the two groups of farms. The sludge was effective in increasing crop yields over yields without sludge or fertilizer.

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The Capital

ANNAPOLIS, MARYLAND, TUESDAY, AUGUST 5, 1986

BIG EARS

Sludge saves thirsty crops

By JUDI PERLMAN
South County Staff Writer

The bright green stalks towered above Arthur Dove's head as he shucked a long, plump ear of corn.

"Look at that. These ears will be nice and big," he said.

With farmers agonizing over their drought-stricken crops, one wouldn't think that Dove's healthy feed corn is growing in Anne Arundel County. But it is.

Dove had sludge applied to his farmland — the key to survival during this dry, parched season, he says.

Sludge consists of residual solids and water generated by wastewater treatment plants. Bio-Gro Systems Inc., a county-contracted sludge removal company, hauls the organic residue from the plants and disposes of it. Farmers often like sludge applied to their land because its nitrogen acts as fertilizer.

But many farmers such as Dove say sludge also retains moisture, which has been a life-saver this year.

"I'm sure it has helped the corn a lot. It holds the moisture in the ground for a while," said Dove, whose stalks are at least eight feet high with ears falling away from the stalks — the true sign of good corn.

"It's been as dry here as anyplace else. Without sludge, I would have been hurting," he said.

James Burton, manager of a

(Continued on Page 8, Col. 1)

Photo by Susan Merrikamp

SLUDGE-FED corn towers over Arthur Dove, manager of Willow Lake Farm.

THE CAPITAL Tues., Aug. 5, 1986

Sludge helping farmers fight off drought

(Continued from Page 1)

Davidsonville sod farm, said he has noticed a remarkable difference in the grass since sludge was applied last year.

"It's a lot greener and it grows faster. In April it was growing so fast, we couldn't keep it cut," he said.

"If it had not been for the sludge, the grass would have burned up. We would have gone under," said Burton, who plans to apply sludge this year to another sod farm in Crofton.

For Dove, who manages a 600-acre farm in Davidsonville, sludge is the difference between a profitable and unprofitable year.

His hay is tall and bright green, with yellow and brown patches showing only in areas that did not receive a sludge application.

When Dove first cut his hay, he got 42 rolls on two acres. After applying sludge, he cut another 76 rolls.

"That is tremendous. It should have been less. Usually the first cutting is the best cutting," he said.

While many farmers are complaining that their hay burned up to where they can cut it just once, Dove is ready to cut his hay for the third time.

Health regulations prohibit farmers from applying sludge to land producing food that humans eat raw or that comes in direct contact with the ground, such as lettuce or radishes.

Dove pointed to his crop of sweet corn, which was not applied with sludge. It is waist-high with ears half the size of his feed corn, which is given to cattle.

Sludge not only produces good crops, but it also reduces farming costs, Dove said. He used to apply 500 pounds of fertilizer on every acre but now applies just 100 pounds, which saves quite a bit of money. Sludge application is free.

"The nitrogen stays in the ground, and it's slowly released," Dove said. "I just don't understand why more farmers don't do this."

Farmers are beginning to recognize the advantages of sludge, Bio-Grow spokeswoman Jane Forste said. The number of farms participating in the program has doubled since last year, she said.

"We have more than enough farms for this year's operation," Ms. Forste said. "Farmers are seeing an improved yield in crops on which sludge has been applied."

Bio-Grow adds lime to sludge, which raises alkalinity so that plants can take full advantage of its nutrients, she said.

Sludge does have its drawbacks, however. If too much is applied, it could seep into ground water, and the nitrogen and heavy metal content could cause problems, state health officials said.

The county contracted Bio-Grow in 1984 because sludge was building up at sewage plants. Much of it had to be disposed of in Chesapeake Bay because there was no way to remove solids.

Franklin farmers line up to receive Roanoke sludge

By RICHARD LOVEGROVE
Staff writer

BURNT CHIMNEY — Thar's black gold on them thar' fields.

Just look at one of Ben and William Turner's rented fields in Franklin County. Recently, the 35-acre expanse was covered with a glistening, gooey, black substance. It looked like someone had forgotten to cap an oil gusher.

But while the tarry material will save the Turners money — perhaps as much as $3,500 on this field alone — they aren't rushing out to negotiate a contract for mineral rights. Nor will the field remain black for long.

The Turners and other farmers in Franklin County have been taking advantage of free fertilizer, compliments of Roanoke. Roanoke needed to empty its nearly full sludge lagoons; so it hired **Bio-Gro Systems of Maryland** to do the job. Bio-Gro in turn needed to dump the sludge somewhere; it found an enthusiastic reception among farm-

"If a farmer submitted an application, it would be a year to a year-and-a-half before he'd see the sludge," Dave Motil, project manager in Roanoke for Bio-Gro, said. "Getting land is no problem and neither is (getting) the sludge. We have at least one call a day for sludge and sometimes more."

Farmers enthusiastic because the sludge, which is basically human waste that has been chemically treated, is high in nitrogen with traces of potassium, phosphates and potash, nutrients farmers need for growing crops in local red clay.

But the spreading of human waste on croplands has its aesthetic problems. The idea is new in the United States, although it has been done for hundreds of years in other countries.

"It's just the psychological idea that it's human waste," Motil said. "Ten years from now they'll have to do it."

But for the time being, Bio-Gro is operating under restrictions. The sludge, which has a musty smell much less offensive than cow manure, cannot be spread on fields with crops destined for human consumption. So Bio-Gro is dumping it on pasturelands and land where feed for animals is grown.

Every field must be approved by the state before the sludge can be spread. Bio-Gro keeps the sludge 200 feet from houses, 100 feet from roads, and 25-50 feet from areas that run into a nearby water source. Beef cattle cannot graze on the treated field for 30 days after the application. Dairy cows cannot use the fields for 60 days.

"Everybody uses liquid cow manure," Motil said. "That'll knock you out compared to the sludge. The cow manure is a lot more offensive but they're allowed to spread the cow manure anywhere they want."

The trip to the farmers' fields begins at the city's waste treatment plant, where Bio-Gro has installed a floating platform in one of the lagoons where the sludge has been sitting for about seven years. Beneath the platform is a propeller that breaks up the sludge and a pump that carries it through a line to load in tanker trucks. Bio-Gro has emptied about 11 million gallons so far.

The trucks go to the field Bio-Gro is treating and the sludge is once again pumped, this time from the truck to a teragator or "gator," a huge machine with a tank on top. The sludge is then pushed through a pipe in back of the gator and is sprayed in a circular area when it hits a metal plate at the end of the pipe. The gator takes about five minutes to empty, and a 35-acre field similar to the one Bio-Gro was spraying will take about two days to complete.

The farmer usually plows his field under immediately to avoid loss of nutrients through evaporation.

The teragator, or gator, fills up with a 3,000-gallon load of sludge at the farm site (left) and spews it over the field. The machine can disgorge itself in five minutes and takes two days to cover a 35-acre field.

Photos by Richard O. Cundiff

Bio-Gro already has sprayed about 120 acres for the Turners, who are dairy farmers. William Turner said he is hoping the sludge will save him money on fertilizer but he said it is too early to tell.

"The biggest thing I've noticed is where the fescue is, it makes it turn green real fast," William said. "Also, we feel like we're helping the city of Roanoke out."

Bio-Gro employees are working 16 hours a day, six days a week while the weather is good. When it gets too cold, Motil will shut down because maintenance problems with the equipment make spreading a losing proposition.

Smell from the sludge has generated only one major complaint, which Motil said he still does not understand. Douglas Turner of Burnt Chimney and some of his neighbors said one application smelled bad and caused burning of the thrust for about two weeks. Motil said he has never encountered problems of that magnitude. But when he appeared before the Franklin County Board of Supervisors about the complaint last month, he made assurances that he was willing to work with anyone who had further difficulties.

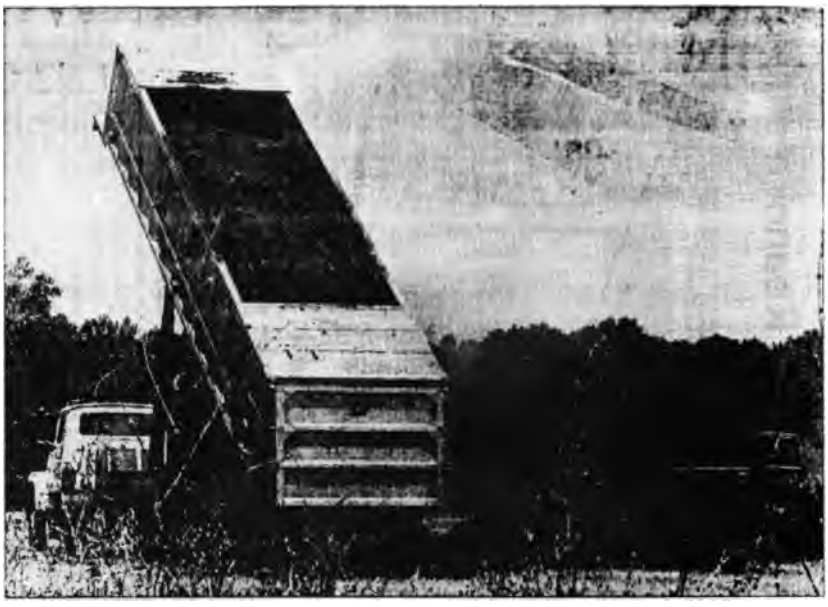
"It doesn't smell nothing like what we put down," William Turner said of the sludge.

The Roanoke project is the first of its sort in Virginia, and Motil is trying to make sure everything runs smoothly to pave the way for future endeavors. To help keep the farmers happy, Motil does not spread when it has rained because the large gator would tear up the fields.

Still, he knows some people will not be happy. Farmers want to know why they cannot get the sludge faster and why Motil cannot follow a chronological list of applicants. Motil explained he must spread everything in one area and then move to another. After he is done in Franklin, his next target is Bedford County.

The supply of sludge will be no problem. After Bio-Gro is finished with the 15-foot-deep lagoon it is working on, there are three others full of natural fertilizer.

2C THE CHARLOTTE OBSERVER Tuesday, May 24, 1988 ••••



STEVE LYTTLE/Staff

A truck dumps treated sludge on land owned by Don Kerr near Marvin in western Union County.

Sludge-Spreading Begins On Union County Farms

By GENE STOWE
Monroe Bureau

MARVIN — The odd odor faded after 7 tons of Charlotte sludge hit the Union County field Monday morning.

The sunny breeze carried only the scent of dry hay stubble and plowed earth, and the sound of green machines loading, spreading and disking the wastewater leftovers on Don Kerr's land.

Charlotte-Mecklenburg Utility Department (CMUD) officer Trille Mendenhall and Bio Gro Systems Inc. officials Donnie Price, Dave Wanucha and Robert Hamilton grinned with Kerr.

"It should help his field a lot," Mendenhall said. "This is a red-letter day for us."

Hard-won permission to spread sludge on Union County farmland means CMUD will clear McAlpine Creek's Sludge Mountain and four other treatment plants' stockpiles by fall.

Moving the stored sludge will cost Charlotte $1.2 million, and keeping up with freshly produced sludge will cost $500,000 to $600,000 a year.

Bio Gro, a Maryland-based firm with a contract to move the sludge, recently finished spreading on Mecklenburg County farms. Half of Sludge Mountain — a 7-foot pile covering 7 acres — is gone.

"We've moved at least 50% of it," Price said. "We hope by the end of the fall to be caught up with it."

Kerr, who led the fight to get county permission for the sludge after commissioners turned down CMUD last August, said he'll plant soybeans in the 11-acre fertilized hay field.

"It looks real good," Kerr said.

Trucks from McAlpine Creek dumped 7 tons at a time. A front-end loader scooped the black compost into two manure spreaders. Wanucha on a tractor disked the sludge into the earth.

Wanucha said Bio Gro calculates how much sludge to spread for the crop to be planted: 14 tons per acre for soybeans, less for oats, wheat and barley.

Farmers, who persuaded commissioners in March to change their minds, say they can save up to $70 an acre in fertilizer costs with the free sludge.

"We apply sludge at agronomic rates — only the amount of nitrogen the plant needs to grow that season," Wanucha said. "He should add some potash to get a good, well-rounded fertilization. Where he saves money is on the nitrogen."

Compared with common 10-10-10 garden fertilizer, Hamilton said, the sludge is about 20-20-0 — lots of nitrogen and phosphorous, little potassium.

Spreading the sludge also solves CMUD's disposal dilemma. Incinerating or burying would be expensive.

"It's for a useful purpose. It is recycling a resource instead of incinerating it or burying it," Mendenhall said. "Not only does it help us, it helps the farmer, too.

"If we can help the farmer with $1, I'm willing to do it."

Bio Gro officials expect to finish Kerr's 324-acre farm this week and move to S.W. Secrest's 934 acres of pasture.

CMUD has a state permit on Jerry Smith's 310 acres and county permission to get permits on Donald McCain's 102, Terry Byrum's 286, Allen Moser's 127, Tommy Manus's 247, Doug Plyler's 208, Hamp Howey's 580, Frank Howey's 649, John Winchester's 53 and William Couck's 385.

Strict state regulations govern the spreading. At Kerr's farm, red-orange flags marked limits for the manure spreader, leaving a buffer around the field.

2-B—Mobile Press Register Saturday, Aug 6, 1988

Metro/Region

Program uses treated waste for fertilizer

By RON COLQUITT
Press Register Reporter

Members of the Mobile Board of Water and Sewer Commissioners recently began a new program that could have local farmers smelling bigger profits next year because of a system they are now using to dispose of millions of gallons of once foul-smelling human waste and garbage, according to a board official.

Water Superintendent John von Sprecken said their new program is quite simple, but effective. The treated waste is being trucked to Mobile and Baldwin county farms where it is used as a fertilizer supplement.

Using the waste can save farmers up to $1,000 an acre on fertilizer costs and is already saving the water board money. This makes the water board members happy and the farmers are discovering that their grass is always greener where the waste is being used.

"We put some on a farmer's field about 10 days ago and you can already tell by the difference in the greener color of the grass and the growth of the grass. After 30 days, I'm not sure he's going to be able to find his cows in the grass, it will be so high," von Sprecken said with a laugh.

Von Sprecken said that, each day, thousands of gallons of human waste and garbage flow through Mobile's sewerage system and ends up at the McDuffie Island Sewage Treatment Facility.

There the waste is treated and becomes a black sludge containing 2 percent solids and 98 percent water.

"Once it leaves the treatment plant it's not harmful, doesn't have a great deal of odor, or any other problems associated with it," said von Sprecken."

For years the sludge was pumped into a shallow pond at the treatment facility and allowed to dry. People were allowed, at no cost, to collect the dried sludge and use it as a fertilizer on farms, gardens and nurseries, von Sprecken said.

New construction in the area prevented the ponds from draining properly and the sludge backed up and would not dry.

Press Register photo by Ron Colquitt

A worker pours treated waste into a tank truck at the McDuffie Island Sewage Treatment Facility. The waste is being used as a fertilizer supplement on farms in Baldwin and Mobile counties.

Different methods of disposal were considered by the board. Von Sprecken said he had heard of Asians and Europeans using their waste sludge to fertilize farmlands so he began checking around to see if it was being done in America.

He discovered that several states were using the system, so the board contacted companies specializing in waste disposal. Through a bid system, Bio Gro Systems of Annapolis, Md., was selected.

Their bid was $3.9 million to remove the sludge for three years. Other methods of disposal would have cost the water board even more than what Bio Gro is charging, von Sprecken said.

Bio Gro sent four big trucks with 6,500-gallon tanks to Mobile. Each day they take up to 18 loads of sludge to farms no more than 35 miles from the treatment plant.

Von Sprecken said they do not charge the farmers for the sludge or its transport, but they may some day charge them transportation costs.

Though it is lacking in some substances essential to plant growth, the sludge is a good source of ammonia and nitrogen, noted von Sprecken.

He said farmers must add fertilizers to their soils depending on what type of crop they plan to raise.

On tree farms, orchards and pasture land, the sludge is sprayed on the ground. On crops such as corn and soybeans, the sludge is plowed or injected into the soil, von Sprecken said.

"On pasture land, from the last day it's put out, no animals or persons are allowed to be in the field for 30 days," he said. "After that you can put cattle back on it.

"The reason for this is, particularly with dairy cattle, there is a slight chance of pathogenic bacteria being alive in this material, but the chance of that is very slight. This is a rule by the Environmental Protection Agency."

Once they reach the farms, the trucks drive through the fields spraying the sludge from the rear of the tanks. Special tractors with oversize tires will be used in fields where there is a problem with packing the soil.

"In addition to the nutrients and organics going back into the soil, the spray of sludge also gives the soil almost an inch of water," said von Sprecken.

How do the farmers like the sludge disposal plan? "Well," said von Sprecken, "it looks like we are going to have to have a lottery to distribute it. We have farmers with a total of about 12,000 acres that want the sludge, and we can only supply about 3,000 to 4,000 acres worth."

Emmett Freeland is a farmer in the Union Church community near Grand Bay, Ala. He has been using the sludge on his land for about two weeks. He is using it on the land where he has a pecan orchard and also on land he is growing grass to feed his cattle.

Freeland commented, "It has a good fertilizer analysis and there is hardly any odor to it. ... It's got a lot of minerals and especially zinc, which the trees really need. We are not going to change our fertilizer program at all, but we are just using this (sludge) as a supplement."

He continued, "We are also using it on the pasture lands. You can definitely see a difference on the pasture. The grass is greener already."

GERALD D. KLECZKA
4TH DISTRICT, WISCONSIN
COMMITTEES:
BANKING, FINANCE AND URBAN AFFAIRS
GOVERNMENT OPERATIONS
HOUSE ADMINISTRATION
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April 22, 1992

The Honorable Glenn English
Subcommittee on Conservation,
Credit, and Rural Development
1430 Longworth HOB
Washington, D.C. 20515-6006

Dear Mr. Chairman:

The Director of Finance and Administration for the Milwaukee Metropolitan Sewerage District (MMSD), Mr. James M. Hill, recently contacted my office concerning H.R. 4360, the Soil Conservation and Domestic Allotment Act Amendments of 1992.

Enclosed is a copy of his memorandum on the issue of sludge. I ask that you clarify the term "sludge", and exclude heat-dried sludge from regulation under the bill. In addition, I share the apprehensions of MMSD, the Environmental Protection Agency (EPA), and the U.S. Department of Agriculture (USDA) over the designation of more than one government agency to the regulation of sludge. While safety and the maintenance of the quality of our soil and water should be our primary concerns, duplication of regulations is not necessary, and may be counter-productive.

Thank you for your time and attention to my request.

Sincerely,

GERALD D. KLECZKA
Member of Congress

GDK/kc
Enclosure

(Attachment follows:)

Milwaukee Metropolitan Sewerage District

Memorandum

April 6, 1992

TO: Laura Saul, Office of the Honorable Gerald D. Kleczka

FROM: James M. Hill, Director Finance & Administration

SUBJECT: H.R. 4360

Bill Summary

HR.4360 requires the Secretary of Agriculture to "establish a program to ensure the safe and effective application to agricultural land of sludge from a treatment works [sewage treatment plant] if the agricultural land to which the sludge is intended to be applied is located in a state other than the state served by the treatment works.

The bill would basically prohibit interstate "commerce" in land applied sludge unless the sludge is determined to be "safe" as defined by the Animal and Plant Health Inspection Service (APHIS) or "other agency" designated by the Secretary of Agriculture. The bill lists the various criteria against which safety is to be measured. The Soil Conservation Service (SCS), in addition, is empowered to set standards regarding: rate of application; method of application (injection or spreading) alleviation of accidental spills during application; restricting areas where sludge may not be applied to protect surface and groundwater; and "such other conditions as may be necessary to carry out the policy of the Act."

The bill (sec. 18(b)(2)) specifically states that the requirements established pursuant to the authorization "shall be in addition to any other requirements that may be imposed on the application of sludge to agricultural lands under any other law." (emphasis supplied) The bill also provides for penalties, authorizes research, and requires the establishment of a fee schedule to fund the Department's activities pursuant to the Act.

Analysis and MMSD Position

It would seem on the surface that HR 4360 is designed only to limit areas of application of wet sludge, such as MMSD s product Agri-Life, principally to prohibit states from "dumping" their smelly sludge on their neighboring or other more distant states MMSD's Agri-Life program is entirely within Wisconsin, and we have no plans to expand to other states, so nominally the bill would appear to have no effect on us. However our experience with the EPA's 503 regulations governing the content and use of heat dried sludge

products (e.g., Milorganite) as fertilizer tells us that the interpretation of an ambiguous bill such as this is wide open, and could affect our ability to sell Milorganite as well. We see the following issues in the draft of this bill which may affect both Agri-Life and Milorganite:

1. The term "sludge" is not defined in the bill. While the inference is to sludge in its liquid form, Milorganite is a heat dried sludge product. At a minimum, we would like to see an amendment which expressly exculudes heat-dried sludge from regulation under the bill.

2. This bill empowers yet another federal agency (besides the EPA) to regulate sludge content. Worse still, the bill's provision that the regulatory requirements promulgated under it are "in addition to" any other similar regulations is an invitation to bureaucratic and regulatory chaos. At a minimum, Congress should specify a single agency to promulgate sludge content and safety standards and regulatory enforcement. It doesn't matter to us which agency (EPA, USDA; hell, the Defense Department for all we care) has this responsibility — as long as we only have to deal with one set of regulations and one army of bureaucrats.

This may end up being a non-issue for us inasmuch as it appears to be intended to apply to interstate commerce in liquid sludges which are applied to agricultural land. However, we would prefer not to leave this interpretation to chance. Therefore, may I request your assistance in securing the necessary amendments and updating me as to the status of this bill. Please share a copy of this with His Honor and let me know if you have any questions or need further information. Your help is appreciated.

JMH:mk:A1179

Joan K. Leavitt, M.D.
Commissioner

OKLAHOMA STATE
DEPARTMENT OF HEALTH

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March 27, 1992

The Honorable Glenn English, Chairman
Committee on Agriculture
United States House of Representatives
Room 1301, Longworth House Office Building
Washington, D.C. 20515

Dear Mr. English:

The Oklahoma Department of Health thanks you for the opportunity to respond to the proposed H.R. 4360, the "Soil Conservation and Domestic Allotment Act Amendments of 1992," relating to proper management of municipal sewage sludge. The Federal United States Environmental Protection Agency (USEPA) has been involved with sludge management since 1979, with regulations 40-CFR 257 and the proposed regulations 40-CFR 503 scheduled for promulgation later this year. The State of Oklahoma has had an active sludge management effort since the early 80's. The current policy of the USEPA and the State of Oklahoma is to encourage the beneficial use of sewage sludge in order to conserve and enhance valuable land resources.

A review of the proposed amendments indicates that considerable duplication of on-going sludge management activities by the USEPA and the state environmental agencies will be required of the Federal Department of Agriculture with passage of this law. It seems appropriate to evaluate the actions proposed for the Department of Agriculture and the Soil Conservation Service, to assure that unnecessary duplication of services, by all agencies be minimized or eliminated.

Section (d) on page 9 of the proposed H.R. 4360 refers to research efforts that the Agricultural Research Service should carry out. The Oklahoma State Department of Health continues to support research activities relating to sludge utilization and is making all possible efforts to further this goal. Oklahoma State University and Oklahoma University continue to indicate interest in performing valid research activities on human, animal, and crop effects from recycling of sewage sludge. The Oklahoma legislature is considering, at this time, new provisions that will require studies of any potential adverse effects of land application, particularly in relation to the inorganic and organic quality of sewage sludge.

Again, we appreciate the opportunity to respond to this important proposal. If we can be of assistance to you concerning this subject please contact Mark S. Coleman, Deputy Commissioner of Environmental Health Services at 405-271-8056.

Sincerely,

Joan K. Leavitt, M.D.
Commissioner of Health

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